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DIGITAL LEARNING ENVIRONMENT DEVELOPMENT: ACTION RESEARCH USING A SITUATED COACHING MODEL WITH ELEMENTARY CLASSROOM TEACHERS INTEGRATING TECHNOLOGY

by

Robert Burggraaf

Bachelor of Arts
Cornerstone University, 2006

Master of Arts
University of South Carolina, 2010

Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Education in

Curriculum and Instruction

College of Education

University of South Carolina

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Accepted by:

Michael Grant, Major Professor

Fatih Ari, Committee Member

Anna Clifford, Committee Member

Lucas Vasconcelos, Committee Member

Cheryl L. Addy, Vice Provost and Dean of the Graduate School

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DEDICATION

This dissertation work is dedicated to my wife, Sarah, and our children, Olivia, Ethan, and Abigail. Their support, encouragement, and sacrifice over the last three years has made this project possible. Thank you for relinquishing many Saturdays and countless nights for me to complete this research. I also dedicate this to the many mentors and friends I have had the privilege of learning under in my career as an educator. These include Dr. Marcella Shaw, Hope Vrana, Joni Coleman, and Dr. Vicki Traufler, among many others. Finally, I dedicate this to all the members of Cohort Zoolander. From the first day of orientation to our hooding ceremony, we have carried one another through the marathon and across the finish line. To all of you, my unending gratitude and appreciation.

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Secondly, thanks to County School District (pseudonym) for allowing me to conduct research within the district. Specific thanks go to Dr. Bill James and Dr. Dixon Brooks for their approval and support.

Finally, I want to acknowledge the administration and teachers at the school research site. Their eagerness to participate and open collaboration made our coaching relationships successful and roundly beneficial. This supportive partnership will continue long after the completion of this study.

ABSTRACT

The purpose of this action research was to evaluate the impact of a situated coaching model for participating teachers at an elementary school. This study focused on three research questions: (1) how do participants experience a situated coaching model for technology professional development? (2) how does a situated coaching model affect participants' digital learning environment scores? and (3) how does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?

This study situated a coach in an elementary school to work with four teachers over a six-week period in modeling, co-planning, co-teaching, and observing classroom lessons while providing feedback. Data were collected through semi-structured interviews before and after the intervention, reflection journals maintained by participants during the coaching relationship, and classroom observations postintervention.

Data were compared using a convergent parallel mixed methods approach. Qualitative data were analyzed using inductive analysis techniques to arrive at themes. Quantitative data were analyzed through descriptive statistics. Six themes emerged from the data: (a) changes in attitudes toward technology, (b) barriers to integration, (c) changes in instructional practices and thinking, (d) effective characteristics of this situated coaching intervention and impactful coaching activities, (e) participants' preparedness for fostering a digital learning environment as described by the ELEOT, and (f) unquantified progress.

Findings indicate participants perceived situated coaching as an effective form of professional development due to specific characteristics (e.g., extended duration, responsiveness to needs, active learning experiences, coherence) and activities (e.g., modeling, co-teaching, and collaborating). Observed frequency of student technology use for gathering/using/evaluating information increased; observed frequencies of use for the other two ELEOT Digital Learning Environment indicators did not change. This model helped participants overcome barriers of a lack of support and a lack of confidence, but was not able to remove barriers of time, classroom management concerns related to technology use, and outside expectations. Implications of findings for technology professional development and for future research are discussed. Limitations of this study included aspects of the study design, the participant population, and the possible influence of my dual role of researcher and school administrator.

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CHAPTER 1

INTRODUCTION

National Context

Technology is pervasive in classrooms across America (Arnone, Small, Chauncey, & McKenna, 2011; Gray, Thomas, & Lewis, 2010; Ruggiero & Mong, 2015; Zhao, 2007). Schools purchase millions of iPads, Chromebooks, and computers annually (Singer, 2015). Project Tomorrow ("The new learning leader," 2018) found 62% of teachers report using digital games on at least a monthly basis with students and 70% of teachers use video as part of instruction. All of this technology has altered possibilities for education (Hughes, 2005; Hutchinson & Woodward, 2014; McKnight et al., 2016; Robinson, McKenna, & Conradi, 2012).

The United States Department of Education continues this push toward increasing technology's presence in classrooms. With passage of the Every Student Succeeds Act in 2015, the new Title IV, Part A block grant, called the Student Support and Academic Enrichment Grant, included support for effective use of technology in education authorized at $1.65 billion annually. Of their allotments, districts are capped at spending no more than 15 percent on devices and digital content, but districts can spend up to 60 percent on educational technology expenditures including professional development, hiring coaches, and developing programs and curriculum for digital learning (Every Student Succeeds Act, 2015; ISTE, 2016).

National expectations do not end with device procurement. The United States Department of Education's Office of Educational Technology in its National Education Technology Plan Update outlines key integration goals including using technology to expand learning experiences outside classroom walls and personalizing learning to allow all learners equitable access to content and materials (U.S. Department of Education, 2017). Recommendations for districts include developing and implementing technological learning resources and aligning them to targeted educational outcomes. Expectations are teachers will construct engaging learning experiences leveraging these high-quality digital instructional materials and take a lead in piloting new classroom technologies (U.S. Department of Education, 2017).

Seismic changes in classroom practice, as this plan envisions, require support and guidance for teachers (Ball & Cohen, 1999; Borko, 2004; Burke, 2014; Durff, 2017; Ertmer, 1999; Guskey, 2003; Stanhope & Corn, 2014). Yet, despite billions of dollars spent (Miranda & Russell, 2012) and three decades of research (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012), less than half of teachers integrate technology to a high degree (Gray et al., 2010; Pittman & Gaines, 2015). Instead, technology integration "is rather peripheral acting, in most cases, as an 'add on' effect to regular teacher-centered classroom work" (Jimoyiannis, Tsiotakis, Roussinos, & Siorenta, 2013, p. 249). Beginning teachers are prone to consider technology integration as an additional layer to classroom environments (Bate, 2010; Clausen, 2007; Hsu, 2016). Teachers primarily utilize technology for creating and displaying their own instructional materials (Dennis, 2013; Groff & Mouza, 2008; Overbaugh & Lu, 2008). Elementary

teachers, in particular, reported using technology primarily for games, overhead displays, and music (Ruggiero & Mong, 2015).

It is important to begin by examining teachers' attitudes and beliefs about technology's role in education (Chen, 2008; Hsu, 2016). Miller et al. (2003) specify a need to understand teachers' pedagogical beliefs, self-efficacy beliefs, and their perceptions about what value technology holds in learning. School districts are estimated to spend an average of nearly $18,000 per teacher annually on professional development yet have little data to demonstrate significant dividends for their investment ("The mirage," 2015). Professional development programs are often too broad and lack specific application to teachers' classroom environments (An & Reigeluth, 2012; Blank, 2013). To result in maximum effectiveness, training needs to take place with direct application to teachers' classroom context (Blank, 2013; Borko, Whitcomb, & Liston, 2009; Hunzicker, 2011; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Pittman & Gaines, 2015; Ruggiero & Mong, 2015; United States Department of Education, 2017). Personalized support, including direct coaching (Blannin, 2015) and mentor programs (Mueller, Wood, Willoughby, Ross, & Specht, 2008), are necessary to meet teachers' wide range of learning needs. Current professional development programs' ineffectiveness stems from focusing more on exemplary teaching practices than core foundations and conditions necessary to progress to an exemplary level (Kuijpers, Houtveen, & Wubbels, 2010), a failure to account for local context (Craft, 2000; Hunzicker, 2011; O'Hara, Pritchard, Huang, & Pella, 2013; Penuel, Fishman, Yamaguchi, & Gallagher, 2007; Starkey et al., 2009), and a lack of sustained support (Guskey, 1994; Johnson, Sondergeld, & Walton, 2017; Rogers et al., 2007). Pittman and

Gaines (2015) identify a gap in empirical research investigating quality characteristics of professional development correlated to higher-level technology integration, specifically in elementary school settings.

This study sought to begin addressing this research gap by using a situated coaching professional development model in an elementary school context. This coaching professional development model contrasted with traditional technology professional development offerings and thus yielded insights into how to more effectively present technology integration principles. Use of classroom observations and a standardized observation instrument may have more accurately captured any resultant influence on teachers' pedagogical practices and classroom learning environments than surveys or other instruments used in previous research.

Local Context

This action research occurred at a public elementary school named South Elementary School (a pseudonym), which is one of the schools in the County School District (a pseudonym). Any state-specific references or data have been removed for purposes of protecting participants' identity. The state's Educational Technology Plan outlines several goals for school districts, including incorporating digital content into instruction and using instructional delivery models that capitalize on technology to support learning. This document highlights six state-funded technology coach positions throughout the state. None of these funded positions work with districts in the area, so local districts, including County School District, have attempted to fund technology coaches out of general fund budgets.

During County School District's 2013 accreditation review by AdvancED, reported findings included that the district needed to provide better technology infrastructure and equipment. In line with national averages, County School District's review team observed and reported a digital learning environment average score of 1.8 out of 4. These findings resulted in issuance of a required action, to "identify, provide support, implement, and monitor instructional strategies that develop critical thinking skills, promote student engagement and collaboration, and use technologies as learning tools" (Gilbert, 2013, p. 20). This district external review team, in a second required action addressing technology, documented that teachers had limited opportunities to apply technology training in their classrooms and were often unprepared for technology use (Gilbert, 2013).

As part of their response to those required actions, County School District's Board created two additional technology coach positions to supplement one current position, targeting needs at elementary, middle, and high school levels. In November 2014, a bond referendum passed with strong community support, allocating $9.5 million to initiate and sustain a one-to-one mobile device program across all grade levels, wherein each district student is assigned his/her own individual mobile device to use in support of learning. To better extend support to teachers, district technology coaches implemented a Technology Integration Specialist program wherein teacher representatives from each school met monthly with their respective coach to learn about tools, trends, and constructivist pedagogy to take back and share with their faculties.

After millions invested in infrastructure, hardware, and personnel, results to date have been on the rise. In 2018, a new AdvancED team accredited County School District

and reported a digital learning environment score of 2.33 out of a 1 to 4 scale. Observers found students using technology to gather and evaluate information more often (2.75) than seeing deeper levels of integration such as research, creation, and communication (1.98). Providing iPads allowed teachers to use technology in student learning for basic information searches and content delivery, but professional development related to deeper levels of technology integration is not translating into changes in opportunities for students to process information or demonstrate learning.

District teachers recognized a need for integrating student use of technology into their classrooms. Responses to the district's annual needs survey cited technology-related topics as seven of the top fifteen identified areas for professional development in the coming school year. In a recent, mandatory third grade professional development meeting after school, an open-ended question was posed to teachers through Poll Everywhere asking what they perceived as the biggest barrier to integrating technology. Nearly one in three of this district's third grade teachers prominently cited time for their own learning and subsequent planning for student use, consistent with findings from other studies (Baran, 2016; Hsu, 2016; Park & Ertmer, 2007). Indeed, studies conclude teachers need between 50 and 80 hours of consistent, intensive, personalized professional development before lasting changes to instructional practice occur (Darling-Hammond, Chung Wei, Andree, & Richardson, 2009; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007).

Beginning in Fall 2012, County School District's model had three instructional technology coaches, one responsible for each level of school (elementary, middle, and high). The elementary coach worked with approximately half the teachers and students in the district, responsible for close to 300 teachers and administrators across nine different

schools. This model failed to provide required levels of support for teachers and, consequently, led to slow growth in observed levels of technology integration as evidenced by Digital Learning Environment observation scores using AdvancED's Effective Learning Environments Observation Tool.

In Fall 2018, I left my position as elementary instructional technology coach to become an assistant principal. This technology coach position was not filled and now two coaches are responsible for the district's approximately 650 teachers and administrators across fourteen schools. Current professional development practices are not likely to help County School District advance technology integration practices rapidly enough to reach its goal of an overall digital learning environment rating of 3.0 across all indicators. One potential strategy to reach this goal is for district personnel to pursue a new model of professional development, such as situated coaching.

County School District's recent three-year technology plan outlined ambitious goals by Spring 2019, including that all students and teachers would have become proficient in effective use and integration of technology for problem-solving, collaboration, inquiry, and reflection in classroom instruction. For student and teacher proficiency to occur, changes in professional development strategies offer promise for better equipping teachers to integrate technology into instructional delivery methods and students' learning processes.

Statement of the Problem

County School District's current coaching model does not meet teachers' professional development needs or provide teachers with a necessary level of support to

increase Digital Learning Environment scores. This existing model was not likely to lead to achieving stated goals for technology integration in classroom instruction.

Purpose Statement

One purpose of this action research was to analyze how teachers experience a situated coaching model for technology professional development. A second purpose of this research was to assess a situated coaching model's effect on digital learning environment observation scores for elementary classroom teachers at a County School District elementary school. Finally, a third purpose of this research was to examine the impacts of a situated coaching model on teachers' perception of barriers related to implementing a digital learning environment.

Research Questions

Specific research questions for investigation include:

1. How do participants experience a situated coaching model for technology professional development?
2. How does a situated coaching model affect participants' digital learning environment observation scores?
3. How does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?

Statement of Researcher Subjectivities and Positionality

Though now an elementary assistant principal, I served as the district's elementary instructional technology coach for the previous five years. When I began as a coach, County School District had no districtwide technology for students and had not utilized a technology coaching model previously on which to build. I relied on

information gleaned from conferences, books, and following other professionals on social media to identify tools and strategies for integrating technology into teaching and learning.

Having had no official prior training in educational technology and concerned that my current coaching methods were not changing teachers' instructional practices, I decided to pursue this doctoral degree to both better my own understanding of current trends and philosophies and to explore coaching models and strategies that might better help teachers incorporate technology integration concepts into classroom practice. Now as an administrator, the number of teachers I work with has narrowed, but my focus has not. If a future budget were to allow additional personnel, I want to know if a technology coach would be a beneficial use of resources.

For me, technology has always played a part in education, beginning when I was in elementary school. I have never had to wrestle with merging technology with a preestablished pedagogical framework (Bull, 2010; Ertmer, 2005; Quadrini, 2013). I search out new concepts, compelled in part by my own curiosity to stretch teachers' boundaries and show how technology opens new avenues of exploration. This willingness to try new things comes with a personal acceptance that though ideas may not always yield initial success, there is no shame in learning from mistakes and trying again (McIntosh, 2012). These characteristics make it difficult for me to understand when teachers are reluctant to try new things out of fear of failure or a complacent satisfaction with current practices. I grow frustrated when teachers lack interest in independently seeking out opportunities for learning and professional growth. These attitudes will negatively impact coaching relationships if left unchecked (Seid, 2017). As an

elementary school administrator, former elementary technology coach, and a parent of elementary-aged children, I am interested in learning how to better help teachers at this critically formative stage of education incorporate technology to redefine student learning.

I adhere to a pragmatic worldview, understanding that relevant data takes many forms and cannot be limited to one type of collection instrument (Creswell, 2014). All stakeholders interpret a single reality of a need for technology integration professional development through unique lenses that shape the nature of professional development, the time provided, and the participation in those offerings. My subjective epistemology acknowledges an inability to detach values and social influences in perceptions (Clayton, 2013; Zeni, 1998); therefore, I am more concerned with increasing situational understanding as opposed to uncovering scientific truths (Denzin & Lincoln, 2005; Patton, 1990). Pragmatism resonates with my intended focus on changes to classroom practice (consequences) and teacher perceptions (meanings) using a chosen professional development model (Denzin, 2012).

I classify myself as both an outsider and insider (Herr & Anderson, 2005). Working in this district for fourteen years, including as a teacher, technology coach, and administrator, I possessed an insider's understanding of classroom dynamics, instructional strategies, and the complex role of teaching. As a former technology coach for this school, I had previously conducted professional development ranging from presentations for the entire faculty, meetings with individual grade levels, coordination of technology projects with faculty and administration, and consultation on technology purchases. More dominant outsider factors included that I was newly part of their faculty

and staff and had an evaluative aspect inherent in an administrative position. Power and gender dynamics merited consideration as a male researcher working with solely female teachers, potentially leading to discomfort or distrust (Lee, Smith, & Cioci, 1993; Newton, 2006). For this study, I functioned in a role described as participant observer (Mertler, 2017). Though I maintained a role as researcher, I predominantly spent time as an instructional technology coach collaborating with teacher participants throughout this study.

To mitigate effects of my positionality, a first step was establishing a unified goal of educating children. I explained how this action research was designed to improve a situation of mutually relevant interest and would be a reciprocal relationship. Teachers gave their time, their classroom, and stepped outside their comfortable instructional practices. In return, I gave support, instructional strategies, and feedback to improve practice. As an administrator at the research site, this professional relationship continues after the conclusion of this research. I communicated that any data gathered would be used to evaluate this situated coaching model, but not individual participants. As much as possible, data would be aggregated to avoid drawing school or district administrators' attention to individual teachers. Pseudonyms mask individual data when used. Observation scores were maintained on paper copies of the observation instrument instead of logged in the online tool so scores were not accessible by school or district administrators. This allowed me to establish supportive relationships with participating teachers and provided further confidentiality with results. My dialogue with teachers needed to be suggestive, not directive. I frequently affirmed that I was there to support professional growth, not evaluate and report professional shortcomings.

As a former instructional technology coach and current school administrator, I had a subjective interest in seeing this model positively impact participants' practices. My bias to technology's educational significance and my value of continued professional growth inseparably impacted my research. I needed to avoid pride or personal biases leading to misinterpretations or misreporting of results. One way I acknowledged and limited effects of this bias was through bracketing (Tufford & Newman, 2010). By writing brief memos during data collection and analysis, I documented my own feelings and thoughts through observational comments (Cutcliffe, 2003). This helped me set them aside when working with data, when a failure to acknowledge them may have clouded my perspective or interpretations.

Definition of Terms

Adult Learning Theory – theory developed by Knowles (1973) that describes necessary conditions for adults' cognitive development.

Attitudes toward technology – participants' feelings toward technology in general, their sense of personal competency with technology, or their feelings about using technology in a classroom (Blackwell et al., 2013; Chiu & Churchill, 2015; Ertmer, 2005; Ertmer et al., 2012; Kim, Kim, Lee, Spector, & DeMeester, 2013; Naaz, 2012; Tondeur, Pareja Roblin, van Braak, Voogt, & Prestridge, 2016).

Barrier – a factor that impedes or blocks teachers' implementation of technology integration practices in classroom instruction (Ertmer, 1999).

Change in practice – a change, attributable to new learning about technology, in how a participant planned, instructed, assessed, or structured lessons (Heineke, 2013; Jones & Moreland, 2004; Parise & Spillane, 2010).

Cognitive Apprenticeship Model – model derived from Social Cognition Theory that focuses on how information passes from expert to learner through a process of modeling, coaching, scaffolding, articulation, reflection, and exploration (Collins, Brown, & Newman, 1989).

Coherence – how well new professional learning aligns with what teachers have already learned, aligns with relevant standards and frameworks, and supports existing personal, school, or district goals (Garet, Porter, Desimone, Birman, & Yoon, 2001).

Co-teaching – when a coach or an expert teaches a lesson alongside the classroom teacher (Heimer, 2017; Killion & Harrison, 2005; Seid, 2017).

Differentiated instruction - planning for and accommodating student differences to aid in students' learning (Subban, 2006; Tomlinson, 2010)

Digital learning environment – refers to students using digital tools to analyze information, to conduct research and present information, and to communicate and collaborate with others (AdvancED, 2016).

Digital tools - refers to computers, mobile devices, peripheral devices, networks (including Internet-based websites and resources), computer software, and mobile applications (National Center for Education Statistics, 2010).

Effective professional development – effective professional development yields changes in teachers' instructional practice (Garet, Porter, Desimone, Birman, & Yoon, 2001).

First-order barrier – an inhibiting factor outside of the teacher, such as a lack of access to technology, a lack of time available for learning and planning, or a lack of professional support (Brickner, 1995; Ertmer, 1999).

Instruction – how students acquire new information or skills, as well as how students use and make sense of the new information and skills (Parise & Spillane, 2010).

Job-embedded – professional development that takes place within the context and working hours of a teacher's normal workday (Hunzicker, 2011; Pettet, 2013).

Modeling – when a coach or expert demonstrates an instructional practice or activity in a classroom context for a teacher to observe (Collins et al., 1989).

Relational trust – when two or more individuals agree on each other's roles and expectations within interactions and have confidence the other person(s) will fulfill their obligations; developed through prior respectful exchanges and demonstrated willingness to extend themselves beyond minimum requirements (Bryk & Schneider, 2003).

Second-order barrier – an inhibiting factor stemming from within a teacher, such as a negative attitude toward technology, a lack of confidence or comfort with technology, or perceived pressure to meet expectations (Brickner, 1995; Ertmer, 1999).

Situated coaching model – a model in which "educational technology experts [are placed] in schools on an ongoing basis where they collaborate directly with teachers" (Swan et al., 2002, p. 169). This method allows a coach to address teachers' perceived issues within their natural classroom environment (Sugar, 2005).

Situated Cognition Theory – theory that posits situation, context, and students' interaction with learning all play vital roles in learners' ability to apply new knowledge to appropriate situations, working in tandem to move a learner from the periphery of a culture to full participant status (Brown, Collins, & Duguid, 1989).

Student use – means that students utilize technology as a seamless component of their education across a curriculum (Strudler & Hearrington, 2008). Integration

is demonstrated when students can access and independently select tools to help them in acquiring, making sense of, and sharing their learning (ISTE, 2000).

Teacher professional development – learning opportunities for teachers designed to yield changes in teachers' instructional practice (Garet et al., 2001).

Technology coach – an individual who works to support teachers in their use of technology for teaching and learning through researching, modeling, observing and providing feedback on effective classroom practices (Blazar & Kraft, 2015; Heineke, 2013; Seid, 2017; Sugar, 2005).

Technology integration – the thoughtful use of technology for teaching and learning, incorporating strategic planning, pedagogical strategies, and instructional design (Cifuentes, Maxwell, & Bulu, 2011; Mishra & Koehler, 2006).

Third-order barrier – a perceived inadequacy in effective instructional design or a difficulty aligning technology to learning goals (Makki, O'Neal, Cotton, & Rikard, 2018; Tsai & Chi, 2012).

Value of technology – teachers' beliefs about the importance of technology's role in teaching and learning or their belief about the ability of technology to positively contribute to student learning (Vongkulluksn, Xie, & Bowman, 2017).

CHAPTER 2

LITERATURE REVIEW

The purpose of this action research will be to assess how teachers experience a situated coaching model for technology professional development and evaluate the influence of a situated coaching model on (a) teachers' perceptions of issues related to integration of student use of digital tools into their classrooms and (b) on digital learning environment observation scores for elementary classroom teachers at a County School District elementary school. Specific research questions for investigation are: (1) How do participants experience a situated coaching model for technology professional development? (2) How does a situated coaching model affect participants' digital learning environment observation scores? (3) How does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?

Due to the extensive topics covered in this literature search, key terms were multiple and varied. Key terms and phrases included technology, integration, elementary, classroom, teachers, instructional, coach, characteristics, role, situated learning, cognitive apprenticeship, theory, pedagogy, action research, and mixed methods. Some combinations of terms such as measure, technology use, and classroom yielded over 300 results, but only two relevant to the research at hand. Conversely, substituting "digital learning environment" for "technology use" reduced returned results to two with none applicable to this topic. Therefore, I determined "digital learning environment" to be too

restrictive and relied more on broad, more widely used terms (e.g., "technology use" or "technology integration" paired with "classroom") for subsequent searches. Initially inclusion criteria informing article selection included research taking place in the United States, in elementary schools, and, when relevant, involving a coaching model. Primary searches sought articles published in the past six years. In order to support subtopics involving effective professional development, learning theories, and perceived barriers, these criteria were too narrow, particularly the date range. Mining reference lists from located articles contributed to locating many additional sources. I examined additional articles ranging back in publication date thirty or forty years if multiple references cited them as foundational research. References for this literature search came primarily through four databases: *ERIC*, *Education Source*, *Proquest*, and *ResearchGate*.

This chapter contains three main sections: (1) technology integration, (2) theoretical framework for professional development, and (3) professional development practices. Conflicting findings, gaps in literature, and criticisms of past research appear throughout.

Technology Integration

Technology integration is a multi-faceted term in education. Few users share a common definition, resulting in inconsistencies in related instructional practices and integration measurement. This first section includes (a) a definition of technology integration as used in this study and an explanation of its derivation, (b) an explanation of potential instructional and learning shifts as a result of integration, (c) a look at how existing research measures technology integration, and (d) barriers to integrating technology in K-12 classrooms.

Defining Technology Integration

There is no single definition of technology integration. Many proposed definitions share similar aspects, however, including an emphasis on instructional practices, use of a design process in making decisions based on goals and needs, and focusing on teachers' purposes for technology use in instruction (Fenton, 2017).

Using multiple types of technology, using technology with greater frequency, nor using technology for a longer duration in a lesson define depth of integration. Rather, how technology is used for teaching and learning and underlying pedagogical practices in lesson design define depth of integration (Ruggiero & Mong, 2015). *Technology integration* is a process of improving content delivery and effective instruction for all students through the seamless use of digital tools (Cifuentes et al., 2011; Earle, 2002). Teachers need support directly dealing with planning and designing instruction involving the use of technology (Strudler & Hearrington, 2008). Radecki (2009) breaks technology integration into three levels: teacher use only at the bottom, use by students for lower-order thinking skills in the middle, and use by students for higher-order thinking skills at the top.

"Integration is defined not by the amount or type of technology used, but by how and why it is used" (Earle, 2002, p. 7). Teachers combine their understanding of technology itself with pedagogical strategies, methods of using technology, content knowledge, and purpose for using technology (Cifuentes et al., 2011; Mishra & Koehler, 2006). To integrate technology more effectively, teachers use a defined design process to make technology decisions based on learning goals. Reflective teachers shift their focus away from technology itself for isolated tasks to carefully planning new student-centered

ways to use technology propelling students toward learning goals that would be difficult or impossible without using technology (Beeson, 2013; Cifuentes et al., 2011; Fenton, 2017; Hutchinson & Woodward, 2014). Integration is a process for students as well. Teachers slowly add new tools and components into their classroom as they scaffold students to create learning experiences (Ruggiero & Mong, 2015). Practitioners strategically select tools that will address students' current learning needs, provide remediation where needed, and stretch students to grow in their learning (Cifuentes et al., 2011; Edmunds, 2008). Technology integration does not happen spontaneously. Effective integration only comes with careful instructional planning and design.

For this study, technology integration is termed as a *digital learning environment* to highlight both the ubiquitous nature of technology in a classroom and the emphasis on student learning. Integration accounts for strategic planning, pedagogical strategies, and instructional design when defined by three components of observed student use: (1) students using technology to collect information, (2) students using technology to process information, (3) and using technology to communicate information.

Shifts in Teaching and Learning

Researchers document misalignment between teacher beliefs and practices regarding classroom technology integration (Judson, 2006; Kim et al., 2013; Shifflet & Weilbacher, 2015). When integrating technology well, teachers adopt a more constructivist mindset and shift instructional practices to facilitate more student-centered learning (Fenton, 2017; Judson, 2006, Ruggiero & Mong, 2015). These shifts stem from students' engagement with technology, allow students to take ownership of their learning and extend that learning beyond the classroom (Hughes, 2005). Researchers found a

range of effects on student learning, from positive to negative, depending on quality of integration (Beeson, 2013; Ditzler, Hong, & Strudler, 2016; Milman, Carlson-Bancroft, & Vanden Boogart, 2014; O'Neal, Gibson, & Cotton, 2017).

Documented misalignment. There is not always a correlation between teachers' professed student-centered beliefs about instruction and their depth of integration in lessons. Some studies find teachers report valuing constructivist-minded, student-centered learning, but then use technology in ways inconsistent with these beliefs (Becker, 1994; Dwyer, 1991; Fisher, Dwyer, & Yocum, 1996; Judson, 2006). Other researchers claim alignment between beliefs and integration practices (Kim et al., 2013; Shifflet & Weilbacher, 2015), showing though pedagogical beliefs merit consideration when designing technology integration opportunities, they are not always a determining factor. Many teachers tend to design technology tasks that only allow passive reception or consumption, yielding traditional forms of instruction that are not necessarily student-centered (Dennis, 2013). When teachers provide needed information for students through technology, students infrequently analyze and evaluate information for learning (Hutchinson & Reinking, 2011).

Similar discrepancies arise when examining relationships between teachers' past learning experiences and their technology integration practices. Some teachers reported similar informal, content-focused, learning experiences highlighting technology's instructional value led them to seek out integration strategies in their own classrooms (Hughes, 2005). Another study reported no significant correlation between teacher age, years of experience, gender, and hours of technology professional development with teachers' integration practices (Tweed, 2013).

Finally, some researchers document a potential for misalignment between selected technology tools and planned learning objectives (Ditzler et al., 2016; Powell, 2014). However, researchers argue that though selected apps may not align directly, how teachers guide student use of selected apps can foster student achievement of learning goals (Castek & Beach, 2013). These alignment issues call into question research that solely focuses on measuring teachers' perceptions or self-reported practices (Bebell, Russell, & O'Dwyer, 2004; Rives, 2012). To obtain accurate data regarding classroom instructional practices and control for potential misalignment, a researcher should collect direct observational data instead of relying on teachers' reporting of classroom practices.

Potential for shifting instructional practices. While teacher use of technology can increase without changes to instructional practice (Ertmer, 2005), technology integration requires teachers to alter instructional practices (Burke, 2014; Collins & Halverson, 2009; Desimone & Pak, 2017; Idrus & Ismail, 2010; Lawless & Pellegrino, 2007; Stanhope & Corn, 2014). Technology allows teachers to shift to a more student-centered, differentiated approach to instruction (An & Reigeluth, 2012; Carver, 2016; Ertmer, Lehman, Park, Cramer, & Grove, 2003; Milman et al., 2014), varying "approaches to what students need to learn, how they will learn it, and/or how they can express what they have learned in order to increase the likelihood that each student will learn as much as he or she can as efficiently as possible" (Tomlinson, 2010, p. 155). Teachers leverage technology to shift to more cross-curricular teaching, addressing multiple subjects within a single lesson or activity (Milman et al., 2014). Teacher reflection is critical in order to continually shift instructional practices toward more effective integration (Hughes, 2005; Hutchinson & Woodward, 2014). These

instructional shifts in how information is presented to students grant more equitable access to learning and more efficient transmission of information.

Student learning shifts. Teachers integrate technology to positively enhance student learning. Students have access to a variety of resources and instructional mediums, allowing for greater independence and control over their learning (Ditzler et al., 2016; Milman et al., 2014; Ruggiero & Mong, 2015). Students more actively engage in and connect with learning (Beeson, 2013; Carver, 2016; Dietrich & Balli, 2014; Fairman, 2004; Hutchinson & Woodward, 2014; O'Neal et al, 2017; Ottenbreit-Leftwich et al., 2010). For example, students' engagement increases as they make choices about how they access new information, use virtual tours and simulations to actively participate in learning, and connect to expert sources outside the classroom through email or video conferencing. Greater engagement can lead to reduced classroom management concerns (Dennis, 2013; Fairman, 2004; Ottenbreit-Leftwich et al., 2010). Learners have opportunities for increased collaborative learning when using technology (Beeson, 2013; Ertmer et al., 2012; Geer, White, Zeegers, Au, & Barnes, 2017; Hutchinson & Woodward, 2014; Pegrum, Oakley, & Faulkner, 2013). For example, students can work virtually with peers to edit a shared document, create a presentation, or discuss a topic in depth in an online forum. With platforms designed to provide individualized pacing and progression through lessons, students receive instruction designed to directly advance their present understanding (Milman et al., 2014; Ruggiero & Mong, 2015). Teachers report perceiving an increase in student understanding as a result of integrating technology into instruction (Beeson, 2013; Carver, 2016). Finally, students use technology tools to demonstrate learning through multiple methods (Beeson, 2013;

Milman et al., 2014). Examples of these methods include videos, websites, interactive presentations, and podcasts. Effective integration enhances students' learning experiences as doors open to new and varied ideas and resources.

Conversely, when integrated poorly, teachers' uses of technology can negatively influence students' learning. Without an expressed purpose and instructional plan, students become distracted by devices and multi-tasking (Carrier, Rosen, Cheever, & Lim, 2015; Dennis, 2013; Ditzler et al., 2016; Garwood, 2013; Holcomb, 2009; Ravizza, Hambrick, & Fenn, 2014; Sana, Weston, & Cepeda, 2013; Seemiller, 2017; Tagsold, 2013; Zucker, Moody, & McKenna, 2009). These distractions lead to decreased student learning due to lost instructional time (Sana et al., 2013; Wood, Zivcakova, Gentile, Archer, De Pasquale, & Nosko, 2012). Teachers' and students' unfamiliarity with devices impede learning as well (Ditzler et al., 2016).

Measuring Technology Integration

Researchers try many different methods to measure technology integration. Authors of existing literature show a lack of consensus on what aspect of integration to measure. Researchers, however, have been more consistent in whom they measure (e.g., teachers and students) and how they collect data (e.g., surveys and observations).

One focus for researchers targets teachers' personal use of technology when measuring integration (Bebell et al., 2004). Recognizing teacher use does not always translate to classroom practice, researchers have examined classroom teaching practices employed using technology (Elmendorf & Song, 2015; Judson, 2006). Others have measured the incorporation of standards and level of technology use to quantify observed practices (Rives, 2012). However, even classroom teaching practices integrating

technology do not always translate to student technology use for learning. To address integration at a student level, still other researchers seek to measure students' cognitive engagement while using technology for learning (Dennis, 2013; Garwood, 2013). This lack of clear focus prevents meaningful discussions of results across studies. Researchers must agree on a consistent definition before they can consistently measure technology integration across different contexts and begin to compare and analyze study results for optimal conditions and supports.

Researchers align much more with who has been measured in previous studies. In many previous studies, teachers constitute the primary focus of research (Bebell et al., 2004; Elmendorf & Song, 2015; Garwood, 2013; Judson, 2006; Rives, 2012). These teachers typically include preservice or novice teachers (Ben-Peretz, Gottlieb, & Gideon, 2018). Though rare in studies to date, researchers are also beginning to examine continued growth and learning for technology integration experts as well (Bergen, Engelen, & Derksen, 2006; Darling-Hammond, 2008; Feiman-Nemser, 2012; Flores & Day, 2006; Lu, 2010; Zwart, Wubbels, Bolhuis, & Bergen, 2008). Only recently have researchers turned their attention to students as a focus (Dennis, 2013; Garwood, 2013). Teachers provide valuable information in exploring integration, but the truest indicator of classroom technology integration comes through observing students as they are actively engaged in learning.

Previous researchers seeking to measure technology integration have used two primary methods of data collection: surveys and observations. Teachers completed surveys and other self-reporting measures to measure changes in beliefs, teaching practices, and technology integration as a result of professional development

opportunities (Adams, 2015; Bebell et al., 2004; Brenner & Brill, 2016; Carpenter & Linton, 2018; Carver, 2016; Cifuentes et al., 2011; Garwood, 2013; Geer et al., 2017; Miranda & Russell, 2012; Inan & Lowther, 2010; Johnson et al., 2017; Lawless & Pellegrino, 2007; Makki et al., 2018; Mueller et al., 2008; Penuel et al., 2007; Pittman & Gaines, 2015; Rives, 2012; Ruggiero & Mong, 2015; Vongkulluksn et al., 2017). These measures often took place immediately after the professional learning opportunity and did not assess for lasting change (Watkins, Leigh, Foshay, & Kaufman, 1998). Researchers wanting to investigate practices first-hand used classroom observations as a method for data collection (e.g., Dennis, 2013; Garwood, 2013; Hsu, 2016; Judson, 2006; Lowther, Inan, Strahl & Ross, 2008). Classroom observations may yield more complete, precise results than teachers' self reports (Judson, 2006; Kawulich, 2005), but duration and timing of observations may hinder data accuracy. Teachers strategically plan for integration at specific points in instruction that may or may not fall within a window of observation, so observing for a short duration or observing at a point in the lesson where technology is not critical to instruction (e.g., science lab or class discussion) may miss planned integration and incorrectly determine integration practices are not taking place. Some research (Grant, Ross, Wang, & Potter, 2005; Lowther, Ross, & Morrison, 2003) has used prearranged, targeted observations in order to specifically address possibly missing evidence of technology integration practices. Regardless, time is needed between professional development and subsequent evaluation in order for participants to embrace new practices and make instructional changes (Doherty, 2011; Ertmer, 2005; Kreider & Bouffard, 2006; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010). To gain a more complete understanding of technology integration, other studies combined both

self-reported data and classroom observations (Garwood, 2013; Hsu, 2016; McKnight et al., 2016; O'Hara et al., 2013; Swan & Jennings, 2002).

A noted gap in existing literature is a lack of a consistent, widely adopted instrument for measuring technology integration. A list of instruments used in previous research such as the Survey of Preservice Teachers' Knowledge of Teaching and Technology (Schmidt et al., 2009), the Levels of Use (Griffin & Christensen, 1999; Hall, Loucks, Rutherford, & Newlove, 1975), the Stages of Adoption of technology (Christensen & Griffin, 2006), the Instructional Practices Inventory – Technology (Valentine, 2012; Dennis, 2013), and the USEIT teacher survey (Bebell et al., 2004) require respondents to analyze their own thinking and practices. Some instruments used classroom observation instead, such as ISTE's Integration of Technology Observation Instrument, developed in conjunction with Arizona State University West (ISTE, 2003) which was later replaced with the ICOT (ISTE, 2008) and the Observation Protocol for Technology Integration in the Classroom (Northwest Regional Educational Laboratory, 2004). My study will attempt to address this gap in consistency by utilizing the internationally employed Effective Learning Environments Observation Tool (ELEOT) from AdvancED. One prior study using this instrument found students using technology primarily for gathering and evaluating information and most infrequently for collaborating or communicating their learning (Szakasits, 2018).

Barriers to Integration

Technology is not integrated equally in classrooms across the country or even between two classrooms in the same school. Researchers have long documented barriers to using classroom technology (Bricker, 1995), but now focus on barriers to integration

specifically (An & Reigeluth, 2012; Burke, 2014; Carver, 2016; Durff, 2017; Ertmer, 1999; Hsu, 2016; Laferrière, Hamel, & Searson, 2013; Makki et al., 2018; Vongkulluksn et al., 2017; Walsh & Farren, 2018). In classrooms where technology integration is weak, teachers cite a variety of perceived first- and second-order barriers.

First-order barriers. First-order, or external, barriers relate to variables outside the teacher. One perpetual barrier is a lack of access to technology for instructional uses (An & Reigeluth, 2012; Burke, 2014; Carver, 2016; Pittman & Gaines, 2015). Teachers cite a lack of time for learning and planning as a second barrier (An & Reigeluth, 2012; Burke, 2014; Hechter & Vermette, 2013; Hsu, 2016; Pittman & Gaines, 2015). Notably, researchers found the significant amount of time required to change instructional practices is one of the most significant and lasting barriers (Adams, 2015; An & Reigeluth, 2012; Becker, 1994; Berg, Benz, Lasley, & Raisch, 1998; Ertmer et al., 2012; Gorder, 2009; Guskey, 1986; Hartley, 2014; Hew & Brush, 2007; Hsu, 2016; Kirkscey, 2012; Kopcha, 2012; O'Neal et al., 2017; Penuel et al., 2007; Pittman & Gaines, 2015; Rives, 2012; Wright & Wilson, 2011). A lack of professional development and technical support, a third frequently cited barrier, leaves teachers feeling ill equipped for integration (An & Reigeluth, 2012; Burke, 2014; Cifuentes et al., 2011; Czajka & McConnell, 2016; Ertmer, 1999; Ertmer et al., 2012; Hew & Brush, 2007; Hsu, 2016; Pittman & Gaines, 2015). When teachers do integrate technology, a fourth potential barrier is negative student behavior (An & Reigeluth, 2012; Ertmer, 1999; Morrison, Lowther, & DeMeulle, 1999; Sandholtz, Ringstaff, & Dwyer, 1997; Seemiller, 2017). Finally, school cultural barriers from leadership and peers stifle innovative integration practices (Durff, 2017; Ertmer et al., 2012; Laferrière, Hamel, & Searson, 2013). When

first-order barriers exist, teachers may not even attempt to integrate technology because they see something blocking their path.

Second-order barriers. Second-order, or internal, barriers exist within a teacher. These are more difficult to ascertain, as teachers sometimes express them through citing first-order barriers (Ertmer, 1999). Researchers have reported close alignment of teachers' perceptions of technology, attitudes toward technology, and levels of integration (An & Reigeluth, 2012; Blackwell, Lauricella, Wartella, & Robb, 2013; Chiu & Churchill, 2015; Durff, 2017; Ertmer, 2005; Ertmer et al., 2012; Hsu, 2016; Kim et al., 2013; Miranda & Russell, 2012; Naaz, 2012; Pittman & Gaines, 2015; Radecki, 2009; Tondeur et al., 2016); Vongkulluksn et al., 2017; Wozney, Venkatesh, & Abrami, 2006). A negative perception and attitude often cause teachers to avoid integration opportunities, whereas a more positive attitude is associated with greater willingness to try new strategies (Blackwell et al., 2013; Chiu & Churchill, 2015; Ertmer, 2005; Ertmer et al., 2012; Hughes, 2005; Kim et al., 2013; Miranda & Russell, 2012; Naaz, 2012; Sandholtz & Reilly, 2004; Sandholtz et al., 1997; Tondeur et al., 2016; Zhao & Fran, 2003). Some teachers see technology's usefulness in instruction, but a lack of comfort and confidence using technology leads them to shy away from integration (An & Reigeluth, 2012; Burke, 2014; Carver, 2016; Durff, 2017; Hur, Shannon & Wolf, 2016; Inan & Lowther, 2010; Miranda & Russell, 2012; Nebbergall, 2012; Noblitt, 1998; Radecki, 2009; Rickard, 1999; Ruggiero & Mong, 2015). For example, teachers may not feel comfortable conducting an Internet search, so they restrict students to using the textbook and library books for research even though they know the information may not be as current as information students might find online. Finally, teachers who feel pressure to meet

administrative, peer, or community expectations for use may feel overwhelmed and avoid integration opportunities for fear of falling short of expectations (An & Reigeluth, 2012; Becker & Riel, 1999; Durff, 2017; Elmendorf & Song, 2015; Laferrière et al., 2013; O'Neal et al., 2017; Sandholtz, 2001). These second-order barriers are not easy to see. Teachers may not even be able to determine the root of any barriers they feel. They must, however, be identified and addressed for teachers to grow in their practices.

Third-order barriers. Recent researchers propose a third-order barrier related to teachers' planning and designing of learning experiences in light of ongoing technological advancements and corresponding changes to educational possibilities (Makki et al., 2018; Tsai & Chai, 2012). How teachers think about and plan for technology integration affect the quality of learning experiences (Angers & Mactimes, 2005; Jones & Moreland, 2004; Yelland, 2005). Even teachers who successfully overcome first- and second-order barriers may feel inadequately prepared for effective instructional design or may have a hard time matching available tools to learning goals (Durff, 2017).

Overcoming barriers. Levels of barriers can work in conjunction with one another, and therefore, must be addressed strategically (Ertmer, 1999). Some methods can help teachers overcome multiple barriers together, whereas other approaches must be used in combination to overcome a single barrier (Ertmer, 1999).

Providing timely professional development grounded in subject content and pedagogy that incorporates the same tools used in classrooms addresses both first-order barriers of lack of professional development and time for planning, while also targeting second-order barriers of comfort and confidence (An & Reigeluth, 2012; Burke, 2014;

Durff, 2017; Ertmer et al., 2012; Hsu, 2016; Laferrière et al., 2013). Assisting teachers with lesson design and development (Durff, 2017; Makki et al., 2018; Miranda & Russell, 2012) jointly provides professional development while reserving time for teachers to plan, helping to overcome third-order barriers while simultaneously mitigating both first- and second-order barriers.

Sometimes strategies are better suited to specifically address one type of barrier. Additional funding for equipment, infrastructure, or support removes many external barriers (Cifuentes et al., 2011). The amount of money spent on technology access during the last two decades has all but removed these external barriers in a majority of classrooms (Ertmer et al., 2012). Therefore, many school districts are now turning their attention to look at strategies for mitigating internal barriers to better make use of their financial investment.

Institutional and peer support eliminates many internal barriers, including a lack of self-confidence (An & Reigeluth, 2012; Durff, 2017; Hsu, 2016; Hur et al., 2016; Laferrière et al., 2013). Institutional support may include designing professional development to show effectiveness of technology integration for increasing student learning outcomes, which helps positively change teachers' beliefs about technology's role in education (Burke, 2014; Ertmer et al., 2012). Another way to increase teachers' confidence and comfort is to model technology integration for teachers (Brenner & Brill, 2016; Ertmer, 1999; Gronseth et al., 2010; Kumar & Vigil, 2011; Polly, Mims, Shepherd, & Inan, 2010). This helps teachers understand what effective integration looks like while simultaneously helping to make expectations appear manageable. Barriers temporarily impede technology integration in classrooms, but carefully employing strategies to

address noted barriers helps teachers overcome these impediments and begin changing teaching practices.

A possible way to tackle all three levels of barriers is to enhance teachers' perceived value of technology for instructional practice. Teachers' beliefs about technology's value for achieving instructional goals is an important factor in their integration practices (Hughes, 2005; Hur et al., 2016; Sandholtz & Reilly, 2004; Sandholtz et al., 1997; Vongkulluksn et al., 2017; Wozney et al., 2006). When teachers value technology, they overcome first-order barriers by making maximum use of available resources and expressing feeling greater levels of institutional support (Vongkulluksn et al., 2017). Teachers' value beliefs supersede second-order barriers, as value beliefs more strongly predict if teachers integrate technology than teachers' beliefs in their own abilities with technology (Hur et al., 2016; Vongkulluksn et al., 2017). Lastly, high perceived instructional value leads to more engaging, student-centered instruction requiring higher-order thinking, mitigating instructional design, or third-order, barriers (Radecki, 2009; Vongkulluksn et al., 2017). Increasing teachers' value beliefs comes through professional development focused on growing knowledge and skills.

Theoretical Framework for Professional Development Models

Strategies for helping teachers overcome barriers, specifically strategies relating to professional development, require a strong theoretical foundation in adult learning. Three theories form the theoretical framework for this study: adult learning theory, situated cognition theory, and the cognitive apprenticeship model. Each is explained in greater detail, followed by concluding thoughts on implications for teacher professional development.

Adult Learning Theory

Knowles (1973) developed his adult learning theory, referred to as andragogy, to illustrate similarities and differences between learning in adults and children. Refined over the past forty years, his work describes necessary conditions for adults' cognitive development (Knowles, Holton III, & Swanson, 2015). Learning environments, both physical and cognitive spaces, must exude trust and respect both among learners and between teacher and students. Adult learners assume a more active role in planning both content and mediums of learning (Goddu, 2012). Before beginning a learning process, an analysis of any assessed gap between adults' current level of performance or understanding and an expected level of proficiency maximizes instructional effectiveness. New learning can then include clear directions for learners, outlining targeted learning objectives and necessary steps for improvement to a desired proficiency. Finally, planned instructional design should allow adult learners to know when they have achieved mastery of instructional objectives. As seen in these characteristics, andragogy places significant emphasis on the adult learner instead of focusing on the instructor (Holyoke & Larson, 2009).

Situated Cognition Theory

Situated cognition theory (Brown et al., 1989) asserts context matters in learning (Orgill, 2007). Also known as situated learning theory, Brown, Collins, and Duguid's (1989) work argues where learning occurs and how students interact with learning play vital roles in learners' ability to apply new knowledge to appropriate situations. A learner gradually masters the language, tools, and craft of an expert culture through authentic activities exemplifying a culture's ordinary practices. This enculturation takes individuals

from the periphery of a culture and moves them into full participant status over time through repeated interactions among individuals already in the culture.

Cognitive Apprenticeship Model

The cognitive apprenticeship model (Collins et al., 1989) derives from situated cognition theory and focuses on six teaching methods that an expert uses to transfer knowledge and skills to a novice. The first three, modeling, coaching, and scaffolding help the novice develop a needed understanding. First, an expert models practices in an authentic activity (Collins, 2006; Collins, Brown, & Holum, 1991; Nichol & Turner-Bisset, 2006). Novices, acting as observers, reflect on what they are seeing and identify techniques and principles modeled (Collins, 2006; Collins et al., 1991; Nichol & Turner-Bisset, 2006). This contrasts with more sequential instruction, which tends to focus on a specific step or skill at the expense of overarching principles (Hockly, 2000). Discussion ensues as novices share findings and compare reflections with one another (Collins, 2006; Ghefaili, 2003). Equipped with a new understanding from observation and discussion, novices apply these new principles and practices themselves (Collins, 2006; Collins et al., 1991; Nichol & Turner-Bisset, 2006). This leads to the second teaching method, coaching, as experts provide both supportive and corrective coaching feedback on novices' practice attempts (Ghefaili, 2003). As novices grow in mastery, the expert provides appropriate scaffolding as the third teaching method, providing needed supports for the novice or doing parts of a task the novice is not yet able to complete. As experience accumulates, novices are better able to understand how their new knowledge influences their practice (Carter, 1990). The expert gradually fades guidance and support to release responsibility (Dennen & Burner, 2007; Vygotsky, 1978). Of utmost

importance through this process is making thinking visible, both on the part of expert and novice (Collins, 2006; Collins et al., 1991). This fourth teaching method, articulation, makes novices verbalize their thinking to explicitly share decision-making strategies, cognitive processing, and procedural sequencing (Collins, 2006; Collins et al., 1991). The fifth teaching method, reflection, allows novices to compare their work with each other and the work of the expert to identify similarities and differences. With time, novices gradually adopt thought patterns and demonstrate skills exhibited by experts on their own (Collins, 2006; Collins et al., 1991; Collins et al., 1989; Dennen & Burner, 2007). After novices have mastered application of practices themselves, experts finally encourage novices in exploration, the sixth and final teaching method, of problem solving and application of learned principles to new situations (Collins et al., 1989). This transfer of cognitive processes hearkens to traditional apprenticeship methods where skills passed from expert to apprentice and ultimately gives this theory its name.

Implications for Professional Development

These theoretical models together yield a framework of implications for teacher professional development. When adults exercise self-direction in learning and apply previous life experiences, they satisfy a need for active participation. This satisfaction often fosters intrinsic motivation for continued learning (Goddu, 2012; Holyoke & Larson, 2009). As noted in situated cognition theory, when learning activities take place in a staff room, teachers isolate their learning in that professional development context and often fail to transfer new learning to a context of classroom practice (Brown et al., 1989; Goddu, 2012). Teaching teachers a desired skill or practice within an authentic context of classroom teaching and learning seems effective when paired with

opportunities for learner collaboration and reflection (Bell, Maeng, & Binns, 2013; McLellan, 1996). Employing a cognitive apprenticeship model with repeated cycles of modeling, independent practice, and coaching feedback can allow a professional development facilitator to strategically choose focus techniques or methods based on observed needs, demonstrate adoption of principles to increasingly diverse settings, or gradually increase task complexity (Collins et al., 1991; Hockly, 2000). By continually keeping tasks slightly harder than learners are prepared to accomplish independently (Vygotsky, 1978), a professional development facilitator can gradually scaffold them from novice to expert practitioners.

Technology Integration Professional Development

Traditional professional development opportunities, led by expert presenters, often occur at a centralized location at a scheduled time (Helm, 2007; Little, 1993; Wesley & Baysse, 2006). These opportunities, ranging in format from afternoon training sessions to institutes and workshops, allow for standardization of communication and provision of required professional development minutes with both the least cost to schools and districts and the shortest time commitment (Desimone, Porter, Garet, Yoon, & Birman, 2002; Diaz-Magglioni, 2004; Garet et al., 2001; Gray, Thomas, & Lewis, 2010; Helm, 2007; Johnson et al., 2017; Little, 1993; Matzen & Edmunds, 2007; Oliver-Brooks, 2013; Parise & Spillane, 2010). Applying an understanding of adult learning and effective professional development to many learning opportunities afforded teachers thus far explains why some professional development models do not yield desired gains (Desimone et al., 2002; Garet et al., 2001; Hunzicker, 2011; Parise & Spillane, 2010; Pettet, 2013; Swan & Jennings, 2002). This section begins by outlining characteristics of

effective professional development, next describes various models of professional learning and the extent to which these models embody effective characteristics, and finally concludes with an argument that a situated coaching model best encompasses characteristics of effective professional development.

Characteristics of Effective Professional Development

Effective professional development yields change in teachers' understanding, decision making, and instructional practice (Garet et al., 2001; Gaytan & McEwen, 2010; Hunzicker, 2011; Johnson et al., 2017; Kolb, 2017; Kopcha, Neumann, Ottenbreit-Leftwich, & Pitman, 2020; Penuel et al., 2007; Pettet, 2013). Researchers have identified a number of characteristics contributing to effective professional development (Garet et al., 2001; Harris & Muijs, 2005; Hunzicker, 2011; Pettet, 2013). Characteristics of professional development likely to yield such changes in practice, include (1) sustained over time, (2) incorporating opportunities for active and collaborative learning, (3) responsiveness to individual needs, (4) job-embedded in a local context, (5) coherence with existing goals, experiences, and standards, (6) aligned with subject-matter content, and (7) followed up with evaluation for accountability.

Sustained over time. Professional development sustained over time is more likely to foster lasting changes in instructional practice (Adelman et al., 2002; Banilower, Heck, & Weiss, 2007; Beasley & Sutton, 1993; Garet et al., 2001; Johnson, Bolshakova, & Waldron, 2014; Johnson & Fargo, 2010; Kraft & Blazar, 2018; Penuel et al., 2007; Porter, Garet, Desimone, Yoon, & Birman, 2000; Supovitz & Turner, 2000). Recommended durations range from 20 hours (Garet et al., 2001) to 100 hours (Banilower et al., 2007; Blank, 2013). When sustained over time, learners tend to receive

higher quality experiences and have more contact hours with expert practitioners (Garet et al., 2001). Effectiveness of contact hours increases when these learning opportunities are spread out over several months, allowing periods of practice and reflection in between (Hunzicker, 2011; Hur et al., 2016; Martin, Strother, Beglau, Bates, Reitzes, & Culp, 2010). For teachers to fully change instructional practices, teachers may need ongoing support for multiple years (Johnson et al., 2017). Change does not happen overnight; professional development's duration needs planning accordingly.

Active, collaborative learning. Effective professional development incorporates opportunities for active, collaborative learning among participating teachers (Blank, 2013; Borko, 2004; Darling-Hammond, 1997; Desimone et al., 2002; Garet et al., 2001; Hunzicker, 2011; Johnson et al., 2014; Johnson & Fargo, 2010). Using student-centered strategies in presenting professional development helps foster active learning opportunities (Johnson et al., 2017). Active learning means teachers play a role in their learning, whether that refers to observing or being observed, planning or practicing implementation of new learning in the classroom setting, reviewing student work, or communicating about learning through presenting, collaborating, or writing (Garet et al., 2001). Collaborative discussion is a strong predictor of changing instructional practices (Fenton, 2017; Parise & Spillane, 2010; Penuel et al., 2007; Showers & Joyce, 1996). When actively learning, teachers exert control over their own learning (Pettet, 2013). Active, collaborative learning takes professional development from something passively received by teachers to something teachers engage with and practice.

Job-embedded. Research contains mixed findings regarding a job-embedded format. Job-embedded professional development has greater authenticity to teachers,

leading them to approach learning with a serious approach (Carter, 2008; Fenton, 2017, Hunzicker, 2011, Mouza, 2009). Corroborating this assertion, educators feel professional development at a school-level is more effective than from a district level (Pettet, 2013). Pettet (2013) also found, however, that educators perceived attending conferences and workshops almost as effective as local professional learning communities. Similarly, researchers found both formal and on-the-job professional development support teachers' changes in practice and merit pursuit (Parise & Spillane, 2010). While studies do not solidly affirm a need for embedding professional development within teachers' jobs, doing so is likely to help teachers perceive relevance to other school-based initiatives or job requirements.

Responsiveness. Unlike professional development designed to target a broad audience, effective learning opportunities target individual participants' needs and skills to increase commitment and participation (Ippolito, 2010; O'Hara et al., 2013). As participants sense dynamic support continually shifting to meet present abilities and needs, they are more likely to apply the new learning and increase their technology integration (Borman & Feger, 2006; Costa & Garmston, 2002; Dozier, 2006; Ertmer & Ottenbreit-Leftwich, 2010; Garet et al., 2001; Hargreaves & Fullan, 1992; Solomon, 2005). By providing suggestions as critical points of need emerge, responsive professional development also contributes to teachers implementing corresponding quick, small shifts in instructional practice (Desimone et al., 2001; Parise & Spillane, 2010; Porter et al., 2000).

Coherence. When considering professional development, district or school administrators who promote coherence align offerings with stated goals and other

planned professional activities. Coherence may mean professional development provides an appropriate bridge between previous activities and future, advanced work (Garet et al., 2001). “When such opportunities are related to each other, as well as to school goals or state learning standards, teachers are able to see the ‘big picture’ that strengthens their motivation and commitment to the ongoing learning process” (Hunzicker, 2011, p. 178). When teachers interpret alignment exists, they tend to perceive new learning as aligned with their own goals and display greater commitment to successful implementation (Penuel et al., 2007). Alignment and coherence reduce any possibility new learning will conflict with existing policies or structures, which otherwise result in barriers to implementation (Johnson et al., 2017). A coherent plan demonstrates to teachers the importance of professional development opportunities to achieving stated goals. Researchers are not unified in their inclusion of coherence however, as Desimone and colleagues (2002) did not find coherence to have a strong effect on participants’ application of new learning.

Content-focused. Technology professional development is more often generalized outside of any specific context (Ottenbreit-Leftwich et al., 2010). “When learning experiences are focused solely on the technology itself, with no specific connections to grade or content learning goals, teachers are unlikely to incorporate technology into their practices” (Ottenbreit-Leftwich et al., 2010, p. 153). Making explicit connections between professional development and teachers’ subject matter content bridges an implementation gap between training and practice. Focusing professional development around content and pedagogical strategies maximizes teachers’ time for learning without having to set aside time for teachers to seek out connections to

practice (Blank, 2013). When aligned to classroom content, professional learning bears directly on classroom practice through reinforcing learning expectations for students, identifying where student misconceptions may arise, and suggesting how best to resolve them (Penuel et al., 2007). Maintaining a content focus requires strategic planning and differentiation for individual grade levels or departments, but demonstrates relevance and authenticity to teachers' daily experience (Hunzicker, 2011). Ensuring a content focus naturally forms conduits for teachers to take learning from a professional development context directly back to their classrooms through improved practices. Specifically focusing on professional development related to technology integration, teachers more readily transfer learning to classroom practices when learned within the context of their specific content area, such as math, biology, or social studies (Hughes, 2005; Luft, Roehrig, & Patterson, 2003; Snoeyink & Ertmer, 2001-2002).

Follow-up evaluation. Professional development is more effective when followed with a method of evaluation for accountability. Teachers prefer this accountability comes through their peers as opposed to school administration (Pettet, 2013). Traditional evaluation measures involve measuring teacher perceptions of professional development, typically through surveys. However these measures fail to assess the goal of professional development, improving student learning through enhanced teaching practices. Follow-up evaluation must measure professional development's impact on student learning (Gaytan & McEwen, 2010). Measuring professional development's impact on student learning supports future decision making on provided support.

Models of Professional Development for Technology Integration

Schools and districts use various professional development models to help teachers integrate technology. These models continue to move from a macro-level approach to a micro-level approach. This section outlines four approaches to technology professional development: a centralized or school-focused model, a decentralized or school-based model, teachers in learning communities, a studio model, and the recently introduced EdCamp model.

Centralized model. A traditional format for professional development, a centralized or school-focused model removes teachers from their school environments and brings them to a central location for extended periods of training (Engelbrecht & Ankiewicz, 2016). This model tends to be more cost effective for districts and allows for dialogue and articulation across schools (Engelbrecht & Ankiewicz, 2016). Contrary to characteristics of professional development, however, this model is typically not for a sustained duration, is not job-embedded, and may or may not be coherent with goals and instructional realities at teachers' school sites (Craft, 2000). Proper planning and design for large-scale workshops, wherein content comes from observations or teachers themselves with periods for focus group discussion, reflection, sharing, and presentation, develops teachers' self-efficacy at solving their own problems of practice (Kayapinar, 2016). Without this planning, teachers find this model inconvenient to fit into their schedules and often have little motivation to attend beyond fulfilling requirements or mandates (Engelbrecht & Ankiewicz, 2016). This model disseminates technology

integration support targeted to the majority, but without targeting individual needs, often fails to translate into changed classroom practice.

Decentralized model. Individual schools have individual goals and professional learning needs. Taking this into account, decentralized professional development, typically led by school-level personnel, occurs within individual schools (Engelbrecht & Ankiewicz, 2016). By situating technology integration professional development within the confines of the school, administrators "achieve a better match of a professional development course to the need and culture of a particular group of professionals" (Craft, 2000, p. 20). This method addresses many shortcomings posed by a centralized model, but still takes place outside of a classroom environment and requires teachers to transfer learning across contexts.

Professional learning communities. Teachers engage in learning communities to support one another in professional growth through collaboration and shared reflection. Professional learning communities allow teachers to sustain learning over a longer duration of time and provide a support network for dialog and experimentation with technology integration (Cifuentes et al., 2011). Placing teachers in control of their collective learning enhances their agency and reduces their dependence on outside experts with whom they may only have limited contact (Hargreaves & Fullan, 2012; Liu, Miller, & Jahng, 2016). By bringing teachers together into learning communities, groups benefit by having multiple voices and perspectives weighing on topics of study as opposed to a single expert voice in more passive models of professional development (Seels, Campbell, & Talsma, 2003). A sustained duration, active and collaborative learning, and frequent focus on content, contribute to this model's effectiveness in

growing teachers. In order for teachers to congregate, however, these learning communities must inevitably take place outside of the classroom context as well.

Studio model. A less common model is a studio model, wherein teachers have the opportunity to test out application of their new learning in a supportive setting. O'Hara, Pritchard, Huang, and Pella (2013) describe a model which divides time for teacher professional development into three equal parts. For one third, teachers receive technology professional development from university facilitators. A second portion allows teachers opportunities to explore and experiment individually and together as a group. Finally, in the remaining third, teachers design lessons using their new learning and share them with their group. Throughout this process, facilitators remain close by to offer support, answer questions, and provide feedback. This model encompasses all characteristics of effective professional development except, when teachers are working together in a studio, they are not in an authentic classroom context.

EdCamp model. Recently, educators have participated in a new, teacher-driven model known as EdCamps. In this model, teachers congregate at a given location and collectively develop a schedule of sessions based on attendees' needs and interests (Swanson, 2014). This model relies entirely on active learning, exploration, and teacher interaction (Swanson, 2014). Though by their nature Edcamps are only daylong events, participant survey data credits ongoing collaboration beyond the event itself as instrumental to transferring learning back to classroom settings (Carpenter & Linton, 2018). Some participants lament a lack of advanced planning occasionally leads to ill-prepared session facilitators (Carpenter & Linton, 2016), but these results seem to vary based more on who attends a given camp. A teacher-driven approach like EdCamps

provides autonomy and empowerment, especially for teachers displaying initiative and a proactive approach to learning, but may not provide a level of consistent support for teachers who are not already comfortable integrating technology into their classrooms.

Coaching Model of Professional Development

Similar to other models discussed, coaching addresses multiple components of effective professional development. A coaching model, unlike other models, however, can take place directly in a classroom context. Situated cognition and cognitive apprenticeship theories support use of a coaching model.

Coaching differs from technical support. Technicians focus on technology, make sure components are connected correctly, help troubleshoot problems, install or update software, and either repair or replace malfunctioning equipment (Sugar, 2005). Conversely, coaches focus on teachers and instruction, working with teachers to plan for technology use in ways that will enhance the teaching and learning process (Lowther et al., 2008; Penuel, 2006; Picciano, 2006; Sugar, 2005). This emphasis on working closely with individuals builds trust and relationships, both of which contribute to successful professional growth (Frank, Zhao, & Borman, 2004; Heineke, 2013; Kondacki, Beycioglu, Sincar, & Ugurlu, 2017; Liu & Hallinger, 2017; Parise & Spillane, 2010; Penuel et al., 2007; Sugar, 2005). A coaching position is not without cost, however, and must be strategically factored into a school budget, potentially at the exclusion of other position or budget categories (Mangin, 2009; Marsh, Bertrand, & Huguet, 2015).

After highlighting roles of a coach, an examination follows of a coaching model's alignment with characteristics of effective professional development.

Roles of a Coach

Coaches assume a variety of roles in working with teachers. They must address the needs individual teachers, while moving them toward the goals of the organization (Gallucci, Van Lare, Yoon, et al., 2010; Knight, 2004; Norton, 2001). Roles include (a) supporter, (b) learner, (c) educator, (d) model, (e) collaborator, (f) observer, and (g) feedback provider. Successful coaches leverage these roles when appropriate to move teachers to a deeper understanding of technology integration and improved practice.

At all times, a coach serves as support for teachers seeking to implement new strategies (Ertmer et al., 2005; Heineke, 2013; Seid, 2017; Sugar, 2005). In working with teachers, a coach may first take on a role of learner (Ertmer et al., 2005) by studying teacher and student needs, seeking out relevant data, and researching effective tools and techniques. Armed with understanding, a coach may then assume a role of educator (Seid, 2017; Sugar, 2005) and share effective strategies or techniques. Teachers may then ask a coach to model these focus strategies or techniques with students (Bell et al., 2013; Brenner & Brill, 2016; Fullan & Knight, 2011; Heineke, 2013; Kariuki, Franklin, & Duran, 2001; O'Neal et al., 2017; Poglinco & Bach, 2004; Seid, 2017). Coaches help facilitate a transfer of learning by collaborating with teachers to plan future instruction integrating new learning (Ertmer et al., 2005; Heineke, 2013; Sugar, 2005). Once teachers have a plan in place, a coach may act as observer (Heineke, 2013; Seid, 2017) and provide feedback based on what they see (Blazar & Kraft, 2015; Ertmer et al., 2005; Seid, 2017). Depending on a teacher's needs, coaches may not need to function in all of these roles each time, nor will they necessarily spend equal amounts of time in each role.

A variety of coaching models exist in an effort to mitigate costs and reach greater numbers of teachers. One model connects a coach and teacher through virtual conferences for collaboration in planning and joint reflection of recorded instruction (Desimone & Pak, 2017; Lawless & Pellegrino, 2007; Sugar & Slagter van Tryon, 2014). A second way of reaching multiple teachers or sites is through the use of coaching cycles (Chapman & Mitchell, 2018; Knight et al., 2015), wherein a coach works with individual teachers for a period of time and then leaves the teacher to implement and practice new learning while the coach moves on to another cooperating teacher or site. After a few weeks, the coach returns to the first teacher to assess their progress and coach through a new set of instructional shifts. These different approaches, however, still lack the sustained, contextual benefits of a situated coaching model.

Situated Coaching Model

A situated coaching model places a coach within a specific school to work with teachers on improving targeted practices (Czajka & McConnell, 2016; Kopcha, 2012; Sugar, 2005). This model also aligns with existing instructional models developed from situated cognition and cognitive apprenticeship theories, such as McLellan's (1996) model of instruction and Atkinson's (1997) steps of cognitive apprenticeship. Unlike other professional development models discussed previously, a situated coaching model meets all aforementioned characteristics of effective professional development.

McLellan's model of instruction. McLellan's (1996) model of instruction includes four key steps: cognitive apprenticeship and coaching, opportunities for multiple practice, collaboration, and reflection. Though designed for classroom instruction of students, this aligns with how coaches work with teachers. First, coaches scaffold

teachers' learning, moving them to a higher level of competence. Teachers use repeated opportunities to practice incorporating new learning into instructional practices to refine their skill and understanding. A coach and teacher collaborate with one another to plan, apply, and carry out newly learned instructional methods. Finally, together a coach and teacher reflect on experiences and determine next steps for coaching (Heineke, 2013).

Atkinson's cognitive apprenticeship steps. Atkinson (1997) identified three steps in a transfer of knowledge through cognitive apprenticeship (Hockly, 2000). First is modeling, which mirrors coaching's model-based input. A second step is coaching, occurring as teachers practice with students in a classroom context and receive feedback and mentoring from a coach. Finally, a third step of fading occurs as the coach gradually releases responsibility for planning, analysis, and reflection to the teacher as he/she grows in their teaching practice. This process requires a sustained relationship between teacher and coach, unique to a situated coaching model.

Relation to effective professional development. A situated coaching model fulfills all discussed characteristics of professional development. Such a model is ongoing over time (Blazar & Kraft, 2015; Desimone, 2009; Desimone & Pak, 2017; Kariuki et al., 2001; Swan & Jennings, 2002; Teemant, 2013). Coaches and teachers actively participate together in the process of designing and planning lessons (Bell et al., 2013; Desimone & Pak, 2017; Keengwe & Onchwari, 2009; Leaman & Flanagan, 2013; Swan & Jennings, 2002). Coaches enter an authentic context, co-teaching and conducting observations directly in teachers' classrooms, providing suggestions for improvement as lessons are in progress (Blazar & Kraft, 2015; Desimone & Pak, 2017; Heimer, 2017; Hunzicker, 2011; Killion & Harrison, 2005; Parise & Spillane, 2010; Seid, 2017). Situated coaching places

an expert alongside a teacher to personal learning opportunities and meet needs in a responsive fashion (Czajka & McConnell, 2016). Working within a school, coaches align their professional development with existing school goals and culture (Desimone & Pak, 2017; Seid, 2017). Coaches and teachers work together to collaboratively solve identified problems in student learning of subject content (Dawson, 2012; Eisenberg & Medrich, 2013; Habegger & Hodanbosi, 2011; Kariuki et al., 2001; Marsh et al., 2015; Putnam & Borko, 2000). Finally, coaches provide explicit feedback on teacher performance and learning (Desimone & Pak, 2017; Keengwe & Onchwari, 2009). This model provides prime conditions for teachers to enhance their technology integration practices.

Impact of Coaching as Professional Development

Situated coaching may address aspects of effective professional development, but ultimately effectiveness is determined by changes in practice. Literature suggests programs integrating one or more aspects of McLellan's model may be effective in facilitating teachers' use of technology for instructional purposes in the classroom (Beyerbach, Walsh, & Vannatta, 2001; Capobianco, 2007; Swan & Jennings, 2002). A coaching model impacts teacher internal beliefs and perceptions while also leading to changes in instructional practice.

Internal changes. As noted earlier, teachers face internal barriers, including a lack of confidence, negative attitudes, and perceived pressure when seeking to integrate technology (An & Reigeluth, 2012; Burke, 2014; Durff, 2017; Hsu, 2016; Laferrière et al., 2013; Miranda & Russell, 2012; Pittman & Gaines, 2015), but these are not fixed. When working with a coach, teachers' beliefs and attitudes about technology's value and role in instruction can change (Burke, 2014; Gulbahar & Guven, 2008; Hughes, 2005;

Ifenthaler & Schweinbenz, 2013a, b; Kopcha, 2012; Lowther et al., 2008; Jenkins, 2013; Pittman & Gaines, 2015; Neuberger, 2012; Stanhope & Corn, 2014). For most teachers, beliefs gradually align with those of the coach (Neuberger, 2012). Teachers displaying resistance to coaching, however, may not alter their internal beliefs about technology (Jacobs, Boardman, Potvin, & Yang, 2017). A coach can leverage opportunities for reflection and strategic questioning to shift teachers' thinking (Dewey, 1933; Heineke, 2013; Kayapinar, 2016; Reis-Jorge, 2007; Richardson, 1994). Teachers' perspective on technology integration is not fixed either. As teachers develop an understanding of their current perspective and are then exposed to alternative perspectives, researchers have documented shifts perspective leading to professional growth (Borko & Putnam, 1996; Hughes, 2005; King, 2002). One such perspective shift is viewing instruction from a teacher-centered endeavor to a student-centered construct (King, 2002). Such shifts take time and personal coaching (Czajka & McConnell, 2016). When a teacher's thinking and perspective changes, the resultant changes to practice are more likely to endure (Knowles, 1973; Stein, Ginns, & McDonald, 2007). Teachers gain knowledge about tools, instructional strategies, and principles of effective integration through working with a coach (Lowther et al., 2008; Jenkins, 2013; Neuberger, 2012; Swan et al., 2002). With support from a coach, teachers' self confidence in using technology grows (Adams, 2015; Ertmer, 2005; Jenkins, 2013; Neuberger, 2012; Schunk, 2000; Sugar, 2005; Swan et al., 2002). Conversely, some teachers reported their confidence in evaluating technology decreased due to their increased awareness of the variety of new technology tools and platforms continually becoming available (Adams, 2015). Active learning opportunities can also contribute to increased confidence (Ertmer & Ottenbreit-Leftwich, 2010;

Gulbahar & Guven, 2008; Lawless & Pellegrino, 2007). Coaches help clarify expectations for integration and align classroom practices to meet those expectations (Killion, 2012). A coach can also assist a teacher with setting their own instructional goals to meet student needs, and then identify ways technology can support those goals (Adams, 2015; Beyerbach et al., 2001; Burke, 2014; Gordon, 2004; Hilgard & Bower, 1966; Hixon & Buckenmeyer, 2007; Hsu, 2016; Knight, 2007; Ottenbreit-Leftwich et al., 2010). After working with a coach, teachers are more willing to participate in future professional development opportunities (Jenkins, 2013). These internal changes lead teachers to think differently about technology integration and feel more positively about their capacity to effectively use technology in instruction, which together contribute to external changes in classroom practice.

External changes. Coaching also leads to external changes in participants' use of technology. Personally, teachers report greater use of technology for planning purposes and a significantly higher use of technology in instruction (Kopcha, 2012; Stanhope & Corn, 2014). This change is an extended progression. Initially, most teachers will increase their usage of technology as they overcome technical challenges while incorporating low-level tasks that require little change to practice (An & Reigeluth, 2012; Barron, Kemker, Harmes, & Kalaydijan, 2003; Ertmer, 2005; Sandholtz & Reilly, 2004). With sufficient time and support, teachers change teaching practices, altering instructional design and learning tasks (Coburn & Woulfin, 2012; Cole, Simkins, & Penul, 2002; Desimone & Pak, 2017; Grossman et al., 2009; Heimer, 2017; Heineke, 2013; Kariuki et al., 2001; Neuberger, 2012; Orrill, 2001; Parise & Spillane, 2010; Sailors & Price, 2010; Stanhope & Corn, 2014; Steckel, 2009; Tschannen-Moran &

McMaster, 2009). Again, the most resistant of teachers may not change practices, likely because of their lack of participation in coaching activities (Jacobs et al., 2017) or setting low-level goals for technology use (Zhao & Cziko, 2001). Classrooms with a teacher engaged in a coaching relationship see an increase in student use of technology (Jenkins, 2013) and reported increases in student engagement (Jenkins, 2013; Stanhope & Corn, 2014). Finally, teachers see improved student learning outcomes after working with a coach and integrating technology (Heimer, 2017). A coaching relationship is an effective method for developing teachers professionally, changing classroom practices, and improving student learning.

Chapter Summary

The term technology integration refers to changes in instructional practices and student learning arising from teachers' strategic planning and use of technology in classrooms. While previous researchers measured integration based on teacher practices and perceptions, a lack of a consistent instrument hampers discussion of findings. Teachers demonstrating low levels of technology integration cite multiple external and internal barriers in their way. Effective professional development, based on principles of adult learning, situated cognition, and cognitive apprenticeship, addresses many internal barriers and can help teachers design learning opportunities involving technology. Many existing models of professional development are not sustained over time, nor do they occur in the context of teachers' classrooms. A situated coaching model encompasses identified characteristics of effective professional development. Working with a coach leads to both internal and external changes in partnering teachers.

CHAPTER 3

METHOD

One purpose of this action research was to analyze how teachers experience a situated coaching model for technology professional development. A second purpose of this research was to examine the impacts of a situated coaching model on teachers' perceptions of issues related to integration of student use of digital tools into their classrooms. Finally, a third purpose of this research was to assess a situated coaching model's effect on digital learning environment observation scores for elementary classroom teachers at a County School District elementary school.

Research Design

Action research best fit this study as I took an active, participatory role in systematically gaining a better understanding of how a change in my own role as a technology coach impacted teaching practices and perceptions of a specific, defined population (McLean, 1995; McMillan, 2004; Mills, 2011; Schmuck, 1997). Findings from this study will enhance my effectiveness in future collaboration with these teachers (Mertler, 2017; Parsons & Brown, 2002). This approach differed from other research approaches by granting a more hands-on role than nonexperimental research while simultaneously removing a level of objectivity necessary for true experimental research (Mertler, 2017).

With a methodical inquiry-based approach to investigating teachers' own practices in a specific setting, action research utilizes a cyclical approach of identifying a

problem, collecting relevant data, analyzing and interpreting this data and ultimately developing an action plan in response to these findings (Carr & Kemmis, 1986; Mills, 2011). Whereas other types of research are detached from daily practice, focusing instead on identifying relationships between variables or establishing theoretical underpinnings, "action research can be used effectively to bridge the gap between theory and practice" (Mertler, 2017, p. 31). This bridge, uniquely characteristic of action research, was beneficial for my study because though studies document effects of coaching models on teaching practices (Heimer, 2017; Neuberger, 2012; Stanhope & Corn, 2014), no prior study incorporated County School District's context-specific culture, history of technology in classrooms, and rapport between teachers and coach.

A second benefit of action research is practicality in practitioner-researchers seeking to improve an identified situation, solve a problem, or strengthen an area of perceived weakness (Fraenkel, Wallen, & Hyun, 2012; Mertler, 2017). County School District's digital learning environment scores (Ryff, 2018) indicated such an area in need of improvement. Action research goes beyond just identifying and solving a problem. This approach involved implementation of a new situated coaching model and reflection on this change's effectiveness, leading to immediate opportunities for application of findings (Mertler, 2017).

Lastly, a third advantage to action research is a participatory nature of a practitioner-researcher engaging in this process and collaborating with colleagues throughout research (Mertler, 2017). Because I conducted action research within my own organization, I had to balance both an insider and outsider perspective (Brannick & Coghlan, 2014). I had to avoid making assumptions as an insider, but also acknowledge

relational dynamics that impacted my work with teachers. As a coach seeking to help teachers improve their practice, I had to work together with participants to understand and respond to their needs in order to provide the support they needed to grow their practices. Working with colleagues in an action research model, there was a level of reciprocity with participants (Robertson, 2000) in that I gathered information and helped them improve their teaching practices. Action research within my own organization allowed for maintaining these cooperative relationships after this study concluded.

I chose a convergent parallel mixed methods approach (Caruth, 2013; Creswell, 2014; Ponce & Pagàn Maldonado, 2015) to capitalize on strengths of both quantitative and qualitative approaches and provide "a more complete understanding of [this] research problem than either approach alone" (Creswell, 2014, p. 32). Quantitative data allowed me to numerically track teachers' technology integration practices and provided a level of objectivity when analyzing results. Qualitative research explored meaning behind the numbers and captured teachers' thinking, unlike numerical data (Caruth, 2013; Creswell, 2014).

A more complete picture of the research problem also came through triangulating multiple data sources (Herr & Anderson, 2005). Data collection began with initial semi-structured interviews of participants regarding their perceptions of barriers to establishing digital learning environments. After implementing a situated coaching model, my second phase of data collection included obtaining both quantitative data through observation scores and qualitative data through teacher reflection journals. A final phase of data collection again explored participants' perceptions of barriers to establishing digital learning environments through postintervention interviews. Data collected across

multiple data sources will either indicate alignment between perceptions and practice or a continued disconnect where identify areas where coaching has not yet transformed the learning environment.

Setting

This action research took place at an elementary school in County School District that served students from prekindergarten through fifth grade. Located in a southeastern state, this school of 450 students was a learning community dedicated to continuous improvement. All classrooms had an average of less than 25 students, with second and third grade having an average of less than 20 students per class. White (62%), Hispanic/Latino (16%), and African American (15%) students constituted the largest subgroups. Approximately 10% of the school's population was transient throughout a school year.

Beginning in 2012, this school achieved an Excellent state rating, maintained that rating in 2013, and fell slightly to a Good rating in 2014. Consistency in leadership was a hallmark of the school. Their current principal, now in her fourth year, previously served as a long-time assistant principal. Consistency carried over to the faculty, as this school boasted nearly a 90% annual teacher retention rate.

This school was the only remaining district elementary school to not receive federal Title I funds. Their lack of supplementary funding hindered their ability to purchase technology beyond tools provided by the school district. Therefore, when students initially received individual mobile devices in 2014, teachers were less familiar with student use of technology for classroom instruction than their peers at other district schools. Yet, during the 2017-2018 school year, classroom observations yielded a Digital

Learning Environment average of 1.95 on a 1 to 4 scale, above County School District's elementary school average of 1.66 and slightly above the overall district average of 1.86. This score was due in large part to the school's preparation for an accreditation visit from AdvancED. The school administration utilized faculty within the school to lead technology-focused professional development sessions after school. Teams of teachers generated anchor charts displaying many ways students used technology for learning so others could tap into their expertise when needing assistance. State report card survey results reflected this focus, with 96.1% of students agreeing or mostly agreeing they use technology to learn. The school subscribed to three instructional software platforms: IXL (math), Reading A to Z, and Explore Learning Gizmos (math and science).

The entire school relocated for the 2017-2018 school year while the original school building underwent extensive renovation. Back in the newly renovated building when this study took place, there were some changes in classroom technology. Each classroom was equipped with a desktop computer, district-issued iPads for each student, and a digital display. Teachers now had new Promethean ActivPanels in their classroom instead of SMART Boards and projectors. A new wireless infrastructure had yet to work consistently. Additionally, issuance of iPads to new students had taken longer that year because the district was operating with two district technology coaches instead of three. The lack of stable WiFi and a slow issuance of iPads led some teachers to abandon planning for student technology use.

Professional development related to technology integration primarily stemmed through a core group of teachers who experimented and explored on their own and then helped their colleagues use the technology tools. Most of the collaboration that took place

centered around technology tools, not the integration mindset for how to plan effective, purposeful use of the tools. Prior to beginning this intervention, there has been no formal technology professional development at this site during the school year. Two classroom teachers served as technology integration specialists and attended monthly professional development sessions led by the district technology coaches at the district office, but there was no formalized process for sharing this new learning back with the rest of the teachers in the building.

While other surrounding school districts have hired technology coaches assigned to a specific school, this district's reliance on district level coaches for maintaining a mobile device program left little time for site-based coaching beyond an email or a screencasted video. This intervention was innovative for this district in the timely, specific, context-based learning these collaborative relationships afforded.

This research took place in four classrooms from second through fifth grade. All classrooms had an average of less than 25 students. Each teacher taught all content areas during a day, so this research took place across their curriculum. Due to required minutes for language arts and math, some teachers were beginning to implement project-based learning as a way to incorporate science and social studies with language arts.

Participants

This school's faculty included 24 classroom teachers, who ranged in age from 22 to 55 and were all White females. Four classroom teachers were new to the school for 2018-2019. Over half of this school's teachers held advanced degrees. Ten of the classroom teachers were with the school when the district first began issuing mobile devices to each student.

For this study, I invited classroom teachers who taught between second through fifth grade to participate. I excluded teachers new to the building and teaching as a profession due to additional requirements placed upon first-year teachers and a lack of background data on their instructional practices. This excluded two teachers, one from fourth grade and one from fifth. Teachers interested in participating were invited to a meeting after school where I explained the purpose of this study, what participation would entail, and how information would be stored and used in reporting findings. Prior to the study, teachers also completed a consent form containing all information necessary for them to make an informed decision about participation (Appendix A).

Four teachers returned consent forms and agreed to participate. Table 3.1 provides an overview of the four participants followed by a more detailed description of each.

Amy was a fourth grade teacher with less than five years of teaching experience, all in the same grade level. She utilized a mix of teacher-centered and student-centered learning practices for classroom instruction, relying more on teacher-directed learning experiences out of a concern about covering grade-level content in limited time, an example of which was a class completion of a chart about Native American tribes. When initially speaking about integration practices, Amy highlighted the use of short instructional videos for social studies and Google Classroom for submitting work, but also spoke of students creating Pic Collages about Native Americans and Shadow Puppets about severe weather. Amy began teaching with limited technology skills and experience, quickly having to learn key tools like Gmail and Google Apps for use as an employee of the school. Most of Amy's professional training came from mentor teachers who did not always provide detailed instruction about how to use available technology

Table 3.1. *Participants*

Participant Pseudonym	Description
Amy	• Fourth grade teacher • Less than five years of teaching experience, all in the same grade level • Began teaching with limited technology skills and experience
Emily	• Fifth grade teacher • Less than five years of teaching experience, all in the same grade level • Began her teaching career approximately the same time this district began issuing mobile devices to students
Melissa	• Second grade teacher • Over twenty years of teaching experience in various early childhood grades • Eagerly sought to shift her instructional practices once students had access to mobile devices
Sarah	• Second grade teacher • Between five and ten years of teaching experience in various early childhood grades • Came into this school's 1:1 iPad environment with prior experience in a district where students had Chromebooks

resources. She contrasted an example from a professional training where teachers were encouraged to explore iMovie and create a video without any direct training, which frustrated her, to a peer teacher going slowly through how to score an open-ended response item on an assessment platform while Amy wrote down step-by-step directions for future reference to illustrate her preference for the latter approach. Amy would try to incorporate technology, but if apps or programs did not work as expected, or if students began to encounter challenges and she was not able to help, an overwhelming concern

about instructional time slipping away resulted in abandoning technology in favor of more traditional activities.

Emily was a fifth grade teacher with less than five years of teaching experience, all in the same grade level. She began her teaching career approximately the same time this district began issuing mobile devices to students. Her instructional strategies have gradually incorporated technology into students' workflow using Google Apps for Education, IXL math lessons, and Explore Learning's Gizmos, despite describing herself as a non-technology savvy early in her career. Emily used structured learning experiences to maintain control of the learning environment and worked diligently to personally prepare for smooth instruction. If technology did not work as expected and she felt this sense of control slipping, she would abandon technology in favor of preplanned backup activities. Emily shared during her preinterview, "I will admit that I am someone who can get very easily flustered when it comes to technology, when something does not work the way that I think it's going to work, and that [is] sometimes what leads me to… say, 'Okay, we're going to…stop doing this and we're going to pick up on this part.'" Technology was primarily used as a vehicle for distributing copies of work, accessing informational links, guided research, and submitting work for feedback. Emily was more apt to integrate technology when she felt a familiarity and level of command with an app or program, though teaching afforded little time for this level of exploration. Her desire for a strong sense of classroom control also hampered Emily's inclusion of opportunities for students to leverage technology for purposes of creation and collaboration, which were not evident in either observation prior to this intervention.

Melissa was a second grade teacher with over twenty years of teaching experience in various early childhood grades. She routinely adopted student-centered learning practices in designing classroom instruction as observed through activities such as a force and motion experiment, student-created nonfiction text feature posters, and a mystery number critical thinking activity, and spent extensive time planning differentiated activities to target students' performance level and academic needs. In previous years, Melissa actively sought out ideas for integrating technology from both the district's elementary technology coach and her peer teachers for student-made audio and video recordings, QR codes, submitting pictures of student work through Google Classroom, and creation of My Stories. One of her recent areas of emphasis was students using technology to communicate their learning to authentic audiences, specifically as a means of helping English Language Learners verbalize their thinking. During her preinterview, she cited an example of how her students took a topic of their choosing and created an instructional video using their iPad's camera for their parents to view. While eager to learn new strategies, concern about her own abilities to use technology and a desire to have a thorough understanding of technology tools prior to use with students limited her exploration of opportunities beyond those shared with her by others she viewed as more adept with technology. When asked what kind of coaching support she would like during this study, she responded there were many tools and strategies of which she was unaware and therefore not using in her classroom but, given exposure, she would be eager to pursue whatever was shared.

Sarah was also a second grade teacher with between five and ten years of teaching experience in various early childhood grades. At her previous school, she had

Chromebooks to use with students and came into this school's 1:1 iPad environment with prior technology experience. Her professional learning resulted in high-quality literacy instruction and a skilled ability to understand her students as readers and grow them in their ability to read and comprehend texts. Sarah sought out current professional trends in high-yield instructional practices, analysis of student data, and effective interventions for striving learners. She was known by her peers for reading and sharing current professional texts with colleagues. Sarah regularly sought instructional learning through leading professional development cohorts, attending sessions for her own professional growth, and following educators on social media. Based on her familiarity with best practices in education, she was aware of the potential benefits of integrating technology but was unsure of ways to integrate technology into classroom instruction, stating in her preinterview "sometimes I don't know what [a digital learning environment] looks like or ideas to get that" and again referring to science and social studies, "I don't really know how to integrate [technology] for them to do some more independent work." Despite this uncertainty, Sarah incorporated student use of technology to access and use information she curated through digital books and websites. Previous observations revealed purposeful uses of technology such as students using a whiteboard app to design and solve original math problems, mirroring student screens to the board as students explained their thinking to peers, and student use of digital nonfiction texts for research.

Intervention

In this study, I implemented a situated coaching model at an elementary school. The following description reviews components of effective professional development and

identifies how this intervention aligned with these components, then provides specifics of the model and its implementation.

Situated Coaching Model Description

Situated professional development seeks to meet teachers' individual needs in their specific place of practice (Czajka & McConnell, 2016; Kopcha, 2012; Sugar, 2005). For a six-week period, I established a situated coaching model by serving as an instructional technology coach embedded in a single, suburban elementary school to target instructional improvement with a small group of teachers (Czajka & McConnell, 2016; Kopcha, 2012; Sugar, 2005). I worked with four teacher participants as an instructional technology coach, seeking to develop their incorporation of student technology use for differentiating student instruction and formatively assessing students' learning. *Differentiated instruction*, or planning for and accommodating student differences to aid in students' learning (Subban, 2006; Tomlinson, 2010), took place through content (using technology to gather and use information), process (using technology to communicate and collaborate), and product (using technology to create original products and solve problems), thus fostering digital learning environments as measured by the ELEOT. My work with participant teachers was embedded in their classroom environment while responding directly to their expressed needs and desires for acquiring new knowledge (Polly & Hannafin, 2010; Mitchell & Cubey, 2003; Sugar, 2005). Each week, I spent three and a half hours of time with each teacher in her classroom. This included one half hour per week during participating teachers' daily planning period, one hour per week after school for reflection and additional planning, and two hours per week of classroom assistance. For the first two weeks, planning

focused on application of learning in math. During the middle two weeks, planning focused on math and language arts. Finally, the last two weeks involved applying learning across all of participants' content areas. Depending on individual needs shared during planning and reflection, classroom assistance took many forms (Kuijpers et al., 2010; Smith, 2000), including modeling a lesson, co-teaching, observing, and giving formative coaching tips as a teacher leads a lesson. Each week built from a teacher's progress the prior week through a cyclic process of coaching, practicing, and reflecting (Kuijpers et al., 2010).

Characteristics of Professional Development and Model's Alignment

Previous research identified characteristics of effective professional development, including sustained learning over time, active and collaborative learning, coherence, a content focus, and follow-up evaluation (Fenton, 2017; Garet et al., 2001; Hunzicker, 2011; Johnson et al., 2017; Penuel et al., 2007; Pettet, 2013). Table 3.2 outlines how each characteristic was implemented in this situated coaching model with further explanation following this table.

Sustained Over Time. For changes in teacher practice to continue after professional development concludes, participants need sustained access to an expert (Blazar & Kraft, 2015; Desimone & Pak, 2017; Garet et al., 2001; Kariuki et al., 2001; Swan & Jennings, 2002). By extending professional development over a long duration, teachers have time to internalize new learning, attempt new practices, reflect on and discuss their implementations with the trainer, and plan next steps. Opportunities to engage in one or more of these learning cycles result in more effective transfer of learning (Hunzicker, 2011). Traditional technology professional development for this

Table 3.2. *Situated Coaching and Effective Professional Development*

Characteristic	How Characteristic is Implemented in Situated Coaching Model
Sustained over time	Professional development with a technology coach extended for a six-week period
Active and collaborative learning	Teachers collaborated with the coach and, together, took an active role in planning, instructing, and reflecting
Coherence	Coaching focus aligned with the focus of this school's existing professional development plan
Content focus	Strategies were shared and developed during co-planning of content-based lessons
Follow-up evaluation	Coaching model intervention were followed with classroom observations to assess changes in teaching practice

district occurred in short after-school workshops or single staff professional development meetings. By situating a technology coach directly in the elementary school, participating teachers had twenty-one contact hours with a coach over a six-week period.

Active and Collaborative Learning. Teachers learn more when they take an active role in professional development (Garet et al., 2001). When teachers collaborate and discuss new learning, they have opportunities to think through new information with one another, ask questions, clarify misconceptions, and reflect together. These types of collaborative discussions yield changes to instructional practice (Parise & Spillane, 2010; Penuel et al., 2007). This situated coaching model contained opportunities for active teacher involvement in instructional planning and facilitating lessons. Teachers collaborated with the coach during lesson planning for thirty minutes each week, through co-teaching lessons and providing in-classroom coaching two hours each week, and in reflection discussions for an additional hour each week.

Coherence. Teachers more readily adopt professional learning aligned with existing school or district goals (Hunzicker, 2011; Seid, 2017). Alignment also enhances teacher commitment to implementing new instructional strategies and practices (Penuel et al., 2007). Alignment reduces potential resistance because teachers perceive new learning as aiding existing initiatives, rather than an additional requirement (Johnson et al., 2017). This coaching model focused on using technology to both formatively assess student learning and differentiate future learning based on student needs. This focus directly aligned with this elementary school's professional growth and development plan and other professional learning opportunities offered to faculty and staff throughout the year.

Content Focus. Traditional technology professional development in this district targets teachers of multiple grades and subject areas in the same forum, preventing the relation of learning to specific subject matter content and instead relying on a focus on general pedagogical strategies. Professional learning is more effective at changing practice when teachers explicitly connect new skills and strategies to classroom content (Blank, 2013). A content focus demonstrates relevance to teachers' everyday practice and does not force participants to seek out opportunities for application (Hunzicker, 2011). This coaching model involved planning weekly lessons with teachers tied to the specific content standards selected for classroom instruction. The first two weeks of intervention implementation directed teachers to focus on math, the second two weeks focused on math and language arts, and the last two weeks focused on planning for all content areas.

Follow-up Evaluation. To ensure effectiveness at changing instructional practices, schools and districts must conduct follow-up evaluations of professional development's impact on teaching and learning (Gaytan & McEwen, 2010). This

intervention embedded formative evaluation weekly throughout six weeks of working with participants as the coach provided explicit feedback to teachers about leveraging their digital learning environments for differentiated learning experiences. After this intervention concluded, I conducted at least two 20-minute classroom observations of each participating teacher to assess their classroom digital learning environments.

Data Collection

Three data sources, including (a) teacher interviews, (b) classroom observations, and (c) teacher reflection journals, guided this study. Each of these is described in greater detail below. Table 3.3 illustrates alignment between research questions and data sources.

Table 3.3. *Research Questions and Data Sources*

Research Questions	Data Sources
RQ1: How do participants experience a situated coaching model for technology professional development?	• Participant interviews • Participant reflection journals
RQ2: How does a situated coaching model affect participants' digital learning environment observation scores?	• Classroom observations
RQ3: How does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?	• Participant interviews • Participant reflection journals

Participant Interviews

While changes in instructional practice are visible, understandings of barriers teachers perceive as impediments to integrating digital learning are better understood through explication (Ottenbreit-Leftwich et al., 2010). Providing participants an opportunity to verbalize their thinking helped them process their own feelings and uncover barriers not immediately realized. Sometimes, initially stated barriers stem from

deeper root causes that require additional probing to identify (Ertmer, 1999). Interviews were utilized to collect this information.

Two 30-minute interviews, one preintervention and one postintervention, were conducted one-on-one with each participating teacher in her classroom. These interviews took place after school to ensure an uninterrupted block of time. Audio of interviews was recorded for transcription as part of data analysis. Semi-structured interview protocols (see Appendix B and Appendix C) guided the interviews. Semi-structured interviews were an effective format for obtaining informative qualitative data because they allowed for follow-up questions to delve deeper into responses for greater detail or explanation if needed (Mertler, 2017).

The initial protocol contained eight questions. Questions began by exploring teaching practices and pedagogical beliefs, before moving into professional development readiness. This initial protocol concluded by asking teachers about their thoughts related to the forthcoming coaching relationship.

Initial interview questions aligned with the three research questions as shown in Table 3.4. Postintervention questions aimed to uncover changes in teachers' perceptions and instructional practices as a result of this coaching intervention. Postintervention interview questions and alignment to the two research questions is shown in Table 3.5.

Classroom Observations

Two classroom observations of each participating teacher's classroom were conducted using AdvancED's Effective Learning Environments Observation Tool (ELEOT) during the nine weeks following the intervention. This instrument examined seven environments through a total of 28 indicators (AdvancED, 2016). Observations,

Table 3.4. *Research Questions and Initial Interview Questions Alignment*

Research Question	Interview Questions
RQ1: How do participants experience a situated coaching model for technology professional development?	• To what degree do you utilize the district's instructional technology coaches? Why? • What kind of coaching support would you like to have during this study? • In what area are you interested in collaborating? Why?
RQ2: How does a situated coaching model affect participants' digital learning environment observation scores?	• Give an example of technology integration you have tried thus far and your thoughts about the experience. • Describe what you think an effective digital learning environment looks and sounds like.
RQ3: How does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?	• What do you hope to learn as a result of participating in this study? • How does technology relate to the pedagogical foundations that form the basis for your classroom practices? • What do you perceive as being the biggest barrier for us to overcome while working together? Why?

Lasting twenty minutes each, analyzed student actions and dialogue to assess learning taking place in a classroom. These seven environments were equitable learning, high expectations, supportive learning, active learning, progress monitoring and feedback, well-managed learning, and digital learning. This study focused specifically on the digital learning environment. The digital learning environment outlined three indicators of student technology use:

- Learners use digital tools/technology to gather, evaluate, and/or use information for learning.

Table 3.5. *Research Questions and Follow Up Interview Questions Alignment*

Research Question	Interview Questions
RQ1: How do participants experience a situated coaching model for technology professional development?	• Which coaching practices were most/least useful to you? Why? • What characteristics of this situated coaching model did you value the most? Why? • How could this coaching model have been improved for greater effectiveness?
RQ2: How does a situated coaching model affect participants' digital learning environment observation scores?	• Tell me about how a specific lesson changed as a result of coaching collaboration • Give an example of how your instructional practices changed over the last six weeks. What do you attribute this change to?
RQ3: How does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?	• How does your instructional planning now compare to your instructional planning before the coaching intervention? • What barrier(s) are you able to work through now as a result of this coaching intervention? How are you able to work through them? • What barrier(s) still exist when trying to integrate student use of technology into lessons?

- Learners use digital tools/technology to conduct research, solve problems, and/or create original works for learning.
- Learners use digital tools/technology to communicate and/or work collaboratively for learning (AdvancED, 2016).

Each indicator received a rating from one to four. A rating of one meant the indicator was not observed during the observation, a two denoted the indicator was somewhat evident, a three indicated the indicator was evident, and a four deemed the indicator very

evident during the observation. AdvancED publishes criteria for the different scoring levels. These rating scale specifics are explained in Table 3.6.

Table 3.6. *ELEOT Ratings Guide*

Factors to consider when using ELEOT:	**Very Evident = 4**	**Evident = 3**	**Somewhat Evident = 2**	**Not Observed = 1**
Routine and systematic	Clearly understood, familiar practice and a regular part of the classroom environment	Generally understood practice but not completely routinized	Singularly used practice and/or not part of the regular routine	Not observed
Quality of application	Deep and more complex application of the item	Moderate to some complex application of item	Superficial or simple application of item	No application of the item
Quantity of students applying item	All or most students applying the item	At least half of students are applying item	Some or only a few students are applying item	No students are applying item
Frequency of application	The item is observed with high frequency	The item is observed with moderate frequency	The item is observed once or very few times	Not observed

A full copy of the ELEOT is included in Appendix D. Appendix E contains a copy of the ratings guide for this instrument.

> To date, data collected from over 45,000 classroom observations has established the overall reliability and validity of ELEOT related to test content, response processes and construct validity. Face validity based on test content has been established through expert judgments of the theoretical relationship between the seven environments and the 28 items describing aspects of those environments. The overall reliability of the measure is .94 using Cronbach's Alpha, which is considered a very strong level of reliability. To assess construct validity, a confirmatory factor analysis of the measure revealed the root mean square error of approximation (RMSEA) as .068 indicating an adequate fit of the model to the data. (AdvancED, n.d.b, para. 3)

Prior to beginning research, I completed an online interrater reliability certification for use of the ELEOT instrument. This certification consisted of watching a series of online videos showing classrooms and explaining experts' scores for corresponding ELEOT items. I passed the certification exam with higher than an eighty percent scoring agreement with trained experts. My ELEOT 2.0 certification is valid through September 2020.

Participant Reflection Journals

Participant reflection journals captured changes in perception and understanding throughout the intervention related to the coaching model and barriers to integration. Appendix F contains a full listing of these reflection prompts. Table 3.7 outlines alignment between provided prompts and the first and third research questions.

While interviews provided insight into overall changes as a result of the intervention, regular journal entries throughout helped determine how long a coaching partnership takes to begin changing thought patterns. These entries also aided in pinpointing specific coaching actions or activities that leveraged significant change. Participants who may have been reluctant to voice thoughts or struggles may have found an outlet in a less obtrusive forum (Creswell, 2014). Additionally, having time to process their thoughts prior to the final interview helped participants provide more detailed responses.

Table 3.7. *Research Question and Reflection Journal Prompt Alignment*

Research Question	Reflection Journal Prompts
RQ1: How do participants experience a situated coaching model for technology professional development?	• What has been your biggest frustration so far while working with a technology coach? Explain. • What is your biggest area of growth so far in working with a technology coach? Explain. • How has your thinking about planning for and implementing student technology use changed as a result of this coaching partnership? • What new thought processes or strategies will you most likely to continue after this partnership? What will be the hardest to continue after this partnership?
RQ3: How does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?	• How does student use of technology align with my school and class mission and vision? • How do you find yourself responding when technology doesn't work as anticipated? • What can lead to frustration and non-productive struggle for students when using technology? How can this be alleviated? • What is your biggest fear when planning for student use of technology? Why? • What is an example of how you have started with purpose and pedagogy before considering technology? • How do you find yourself responding when technology doesn't work as anticipated? • How can you combine technology you've used thus far with other tools and strategies to grow student learning? • Which ELEOT indicator is most difficult to plan for? Why?

Participants responded to three provided prompts each week of the coaching intervention in a provided journal labeled with a preassigned numerical ID. During the intervention, participants maintained sole possession of this journal and assumed responsibility for its security. After the intervention phase concluded, participants submitted this journal for analysis. Once turned in, these journals remained stored in a

locked file cabinet for security and confidentiality. The key matching numerical IDs to participant names was stored in a locked box at a separate location.

Procedures

Procedures for this study were divided into four phases. Table 3.8 below captures activities and estimated timelines for each phase. A more detailed description of each phase follows the table.

In Phase 1, consent forms were distributed to participating teachers during a brief after-school meeting lasting approximately thirty minutes. This setting provided opportunities for teachers to ask questions and ensure understanding of the study's requirements. Once returning consent forms, participants completed a half-hour semi-structured interview during their planning period or after school regarding their perceptions of how they incorporated student use of technology into instruction and their perceptions of barriers they faced in these practices. These interviews took place in their classrooms for participant comfort and convenience. Transcription of these interviews began immediately after data collection so identified barriers could be addressed through coaching sessions in the second phase.

In Phase 2, I established a situated coaching model (Sugar, 2005) for a six-week period. I spent three and a half hours of time per week with each participant in her classroom environment. This included one half-hour segment during their daily planning period, one hour after school for reflection and additional planning, and two hours of classroom assistance. Participating teachers maintained a reflection journal and were expected to craft three entries per week. Journal writing required approximately thirty minutes each week at times convenient for the participant.

Table 3.8. *Data Collection Procedures*

Phase	Phase 1	Phase 2	Phase 3	Phase 4
Timeline	2 Weeks (0.5 hours for distribution/completion; 0.5 hours per teacher for interview)	6 Weeks (3.5 hours per teacher per week)	6 Weeks (40 minutes per teacher)	1 Week (0.5 hours per teacher for interview)
Researcher Activities	• Distributed consent forms • Selected participants • Conducted initial round of interviews	• Worked with participants in coaching role, modeling, co-planning, and facilitating reflection • Met regularly with technology coach • Maintained reflection journal using provided prompts • Analyzed instructional practices for student technology use practices	• Observed and evaluated student technology use during teacher lessons	• Collected teacher reflection journals • Conducted final round of interviews
Participant Activities	• Completed consent forms • Participated in initial interview		• Used new learning to plan and conduct lessons with appropriate opportunities for student use of technology	• Submitted reflection journal • Participated in final interview

In Phase 3, teachers applied new learning on their own as they planned and delivered classroom instruction. I conducted two observations, each lasting for 20 minutes, of classroom instruction from each participant, yielding a total of eight observations, for analysis of student technology use. These unannounced segments took place at varying times during the day throughout the six-week window to capture

instructional practices across content areas. Analysis took place after all data collection was complete.

Finally, in Phase 4, participating teachers submitted their reflection journals and completed another half-hour semi-structured interview in the classroom environments. The questions again focused on their perceptions of how they incorporate student use of technology into instruction and their perceptions of barriers they face in these practices to allow for analysis in how responses changed after the intervention. Transcription and coding of these interviews occurred after all data collection was complete.

Rigor and Trustworthiness

Researchers employ numerous strategies to attest to trustworthiness of qualitative data, including triangulation, member checking, and peer debriefing.

Triangulation refers to using multiple sources of data to prevent misanalysing events in simplistic, incomplete, or erroneous ways (Herr & Anderson, 2005). This study used both teacher journals and teacher interviews to verify accuracy of my evidence (Bloomberg & Volpe, 2008). By maintaining journals throughout this study, teachers' responses in interviews about their perceptions regarding technology integration practices were previously corroborated with their own written reflections. These qualitative findings were further triangulated with previously collected quantitative observation data to verify alignment between practices and perceptions.

I used multiple rounds of member checking, asking participating teachers to review accuracy of my work (Mertler, 2017) in order to contribute to the trustworthiness of my data (Lincoln & Guba, 1985). Participating teachers received a copy of their interview transcripts to confirm accuracy in the transcription process. This prevented me

from attempting to draw findings from an inaccurate base. Participants received copies of the participant descriptions and my proposed assertions and supporting evidence after analyzing qualitative data with additional opportunities to provide feedback and proposed revisions. One example of feedback influencing qualitative findings occurred in the last theme discussed, unquantified progress. Initially the theme as written suggested an insufficiency of this model to align participants' values and goals. Participants felt this approach failed to recognize the progress made in both their value of technology and in their own aspirations for further learning, so the section was reframed to better capture their experience. After my interview data were reviewed and I wrote a final report, participants received a copy of my findings and assertions to verify their verisimilitude. Their substantiation solidified credibility of my findings as the basis for additional future research.

Peer debriefing "involves locating a person who reviews and asks questions about the qualitative study so that the account will resonate with people other than the researcher" (Creswell, 2014, p. 252). Throughout this process of designing my study, implementing this coaching model, and analyzing resulting data, a research professor at the University of South Carolina routinely scrutinized my work during weekly meetings and through ongoing written feedback. Feedback was also elicited from fellow students for clarity and precision. These constructive conversations ensured sound methodology, sufficient descriptive detail in my methodology and instrument description, and justifiable, supported findings from collected data (Shenton, 2004).

Plan for Sharing and Communicating Findings

Initially, I will share findings from this study with administration and study participants in an informal after-school session. Together, we will reflect on this situated coaching model and components they would keep or tweak in future iterations. We will celebrate positive changes to perceptions and practice that take place and recognize each participant for their personal and professional growth. Subsequent presentations will include sharing findings at a school faculty meeting, followed by this district's instructional cabinet at a weekly meeting. Provided I obtain required permissions, I plan to present these findings at a monthly principals' meeting as they plan a budget for the next academic year to encourage them to pursue funding a site-based coaching model with Title I funds and at their annual Board of Trustees' budget workshop. State and national opportunities for sharing findings via paper or poster session include the annual state Educational Technology Conference, the state School Boards' Association meeting, the National School Boards' Association meeting, and the International Society for Technology in Education annual meeting. I would also like to share findings at one of AdvancED's conferences or workshops to assist other schools seeking to improve their digital learning environment scores. At all phases of publication and sharing, names of both participants and this school will be altered to protect confidentiality when reporting survey data, interview responses, or observation data. To maintain this confidentiality, I will have sole access to a locked box where I will retain a list correlating participants with assigned pseudonyms.

CHAPTER 4

ANALYSIS AND FINDINGS

The purpose of this research was to assess participants' experience of a situated coaching model for technology professional development, evaluate the impact of a situated coaching model on digital learning environment observation scores for participating elementary classroom teachers at a County School District elementary school, and evaluate this model's impact on participants' perceptions of issues related to integration of student use of digital tools into their classrooms. It is expected that findings of this study will aid in understanding the effectiveness of a situated coaching model on changes to participants' practices and beliefs. This chapter presents findings from both a quantitative measure (i.e., ELEOT observation scores) and qualitative measure (i.e., participant interviews and participant reflection journals).

Data collection was guided by three research questions:

1. How do participants experience a situated coaching model for technology professional development?
2. How does a situated coaching model affect participants' digital learning environment observation scores?
3. How does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?

Part One of this chapter reports quantitative results and findings obtained from classroom observations. Part Two of this chapter identifies and explains six themes that emerged from qualitative data sources.

Quantitative Findings

Classroom observations were conducted both before and after the coaching intervention. Data from each observation were collected using the ELEOT instrument. The Digital Learning Environment section of this instrument includes three indicators, with each indicator receiving a rating from one to four. A rating of one means the indicator was not observed during the observation, a two means the indicator was somewhat evident, a three means the indicator was evident, and a four denotes the indicator was very evident during the observation. The ELEOT has strong reliability, Cronbach's alpha = .94. A validity measure assessing how consistent indicators are with their associated environmental constructs concludes an appropriate fit (Dawson, 2014).

A total of twelve observations of participants' classrooms occurred prior to implementing the coaching model intervention. An additional eleven observations of these classrooms took place after six weeks of the intervention.

Observation data were analyzed to see if the three digital learning environment indicators were observed more frequently in classrooms as a result of this intervention, indicating a stronger emergence of an overall digital learning environment. The number of observations, arranged by indicator, receiving each rating are shown in Table 4.1. Examples of activities receiving each rating are included in Appendix G.

Pre and Postobservations of Participants' Classrooms

A chi-square test for independence was run to determine if a relationship existed between observation round and rating frequency. The chi-square test compares the

Table 4.1. *Frequency Rating Count for Each Indicator*

Indicator	Participants' Pre (n = 12)				Participants' Post (n = 11)			
	1	2	3	4	1	2	3	4
Gather/Evaluate/Use	6	0	0	6	3	0	1	7
Research/Solve/Create	9	0	0	3	8	0	0	3
Communicate/Collaborate	6	1	0	5	5	0	2	4

frequencies that would be expected if there were no relationship with the actual frequencies observed. The first indicator, rating the Extent learners use digital tools/technology to gather, evaluate, and/or use information for learning, showed a positive shift with participants when comparing counts pre and postintervention, as shown in Table 4.2. Prior to this intervention, one half of observations resulted in an Observed rating. After this intervention, almost three fourths of observations resulted in an Observed rating and the number of observations where this indicator was not observed decreased by half. Although there was a greater frequency of observance after the intervention, the difference was not significant, $\chi^2(1, n = 23) = 1.245, p = .265$.

Table 4.2. *Rating Frequency for Gathering/Evaluating/Using Information for Learning with Sample Population Before and After Intervention (n = 23)*

Observation	Rating Frequency		Total
	Not Observed	Observed	
Pre	6	6	12
Post	3	8	11
Total	9	14	23

A chi-square test for independence was run to determine if a relationship existed between observation round and rating frequency. The chi-square test compares the frequencies that would be expected if there were no relationship with the actual frequencies observed. The second indicator rated the Extent learners use technology to conduct research, solve problems, and/or create original works for learning. Observed frequency of this indicator remained stagnant in participants' classrooms when comparing pre and postintervention, as shown in Table 4.3. The number of observations resulting in a Not Observed rating and an Observed rating are shown in Table 4.3. The difference between the two rounds of observations was not significant, $\chi^2(1, n = 23) = .015$, $p = .901$.

Table 4.3. *Rating Frequency for Conducting Research/Solving Problems/Creating Original Works with Sample Population Before and After Intervention (n = 23)*

	Rating Frequency		
Observation	**Not Observed**	**Observed**	**Total**
Pre	9	3	12
Post	8	3	11
Total	17	6	23

A chi-square test for independence was run to determine if a relationship existed between observation round and rating frequency. The chi-square test compares the frequencies that would be expected if there were no relationship with the actual frequencies observed. The test was run to compare pre and postintervention ratings. The third indicator, rating the Extent learners use technology to communicate and/or work collaboratively for learning, also did not change observed frequency in participants' classrooms when comparing counts pre and postintervention, as shown in Table 4.4. Both before and after this intervention, this indicator was observed in half of participant

classroom observations, thus the difference was not significant $\chi^2(1, n = 23) = .048, p = .827$.

Table 4.4. *Rating Frequency for Communicating/Working Collaboratively with Sample Population Before and After Intervention (n = 23)*

	Rating Frequency		
Observation	**Not Observed**	**Observed**	**Total**
Pre	6	6	12
Post	5	6	11
Total	11	12	23

Comparing Participant and School Classroom Observations

Next, observations of participants' classrooms after the intervention were compared to observations from the school at large during that same time frame for each of the three indicators (see Table 4.5). When comparing participants' data with school data, twelve school observations were randomly selected from 83 total non-participant observations using a random number generator. These school observations, completed by the researcher, were anonymous and not specific to a grade level or subject area. As before, indicator ratings of Two through Four were combined into one group labeled "Observed" to contrast observance with a rating of One, or "Not Observed." This combination also eliminated any zero counts in frequency tables for running subsequent chi-square tests.

A chi-square test for independence was run to determine if a relationship existed between observation round and rating frequency. The chi-square test compares the frequencies that would be expected if there were no relationship with the actual frequencies observed. The test was run to compare participants' and school ratings during the postintervention period. The first indicator, rating the Extent learners use digital tools/technology to gather, evaluate, and/or use information for learning, showed

Table 4.5. *Frequency Rating Count for Each Indicator*

Indicator	Participants' Post (*n* = 11)				School Post (*n* = 12)			
	1	2	3	4	1	2	3	4
Gather/Evaluate/Use	3	0	1	7	2	1	6	3
Research/Solve/Create	8	0	0	3	4	3	3	2
Communicate/Collaborate	5	0	2	4	5	3	1	3

similarly high frequencies of observance between participants' classrooms and the school in Table 4.6. This indicator was observed in over two thirds of classrooms across both groups, but at a slightly higher frequency in the school observations. When comparing both groups, the difference was not significant, $\chi^2(1, n = 23) = .379$, $p = .538$.

Table 4.6. *Rating Frequency for Gathering/Evaluating/Using Information for Learning with Sample Population and School Sample After Intervention (n = 23)*

Observation	Rating Frequency		Total
	Not Observed	Observed	
Sample	3	8	11
School	2	10	12
Total	5	18	23

A chi-square test for independence was run to determine if a relationship existed between observation round and rating frequency. The chi-square test compares the frequencies that would be expected if there were no relationship with the actual frequencies observed. The test was run to compare participants' and school ratings during the postintervention period. The second indicator rated the Extent learners use technology to conduct research, solve problems, and/or create original works for learning. This indicator had a greater observed frequency in the school than in participants' classrooms, as shown in Table 4.7. When comparing both groups, the difference approached significance, $\chi^2(1, n = 23) = 3.569$, $p = .059$.

Table 4.7. *Rating Frequency for Conducting Research/Solving Problems/Creating Original Works with Sample Population and School Sample After Intervention (n=23)*

	Rating Frequency		
Observation	**Not Observed**	**Observed**	**Total**
Sample	8	3	11
School	4	8	12
Total	12	11	23

A chi-square test for independence was run to determine if a relationship existed between observation round and rating frequency. The chi-square test compares the frequencies that would be expected if there were no relationship with the actual frequencies observed. The test was run to compare participants' and school ratings during the postintervention period. The third indicator, rating the extent learners use technology to communicate and/or work collaboratively for learning, also had similarly observed frequencies between participants' classroom observations and the school, as shown in Table 4.8.

Table 4.8. *Rating Frequency for Communicating/Working Collaboratively with Sample Population and School Sample After Intervention (n=23)*

	Rating Frequency		
Observation	**Not Observed**	**Observed**	**Total**
Sample	5	6	11
School	5	7	12
Total	10	13	23

In both groups, noted observation of this indicator occurred in approximately half of observations, but the difference was not significant, $\chi^2(1, n = 23) = .034$, $p = .855$.

Qualitative Findings & Interpretations

This study used two methods for collecting qualitative data. I analyzed transcripts of participant interviews, conducted both before and after implementation of this situated coaching model, and teacher reflection journals using a process of inductive analysis.

Participant Interviews

Participants completed two semi-structured interviews during this study, one before and one after the coaching intervention. Individual interviews lasted approximately thirty minutes and took place in participants' classrooms either during a participant's planning period or after school. Preinterviews included questions regarding participants' perceptions of how they incorporated student use of technology into instruction and their perceptions of barriers to technology integration. Postinterviews asked questions to elicit participants' experiences with the coaching model. In this postinterview, participants' practices and barriers were also discussed to uncover any changes in responses after the intervention.

Participant Reflection Journals

Participating teachers maintained reflection journals during this coaching intervention. Each week, I sent out prompts on Mondays, Wednesdays, and Fridays to guide their thinking and responses. The three weekly responses were completed at times convenient for the participant and not necessarily on the day the prompt was issued. There was no predetermined length for each response.

Table 4.9 presents the quantity of qualitative data by source to highlight the richness of information obtained through these sources. I used 136 unique codes during this initial round of coding.

Table 4.9. *Summary of Qualitative Data Sources*

Types of Qualitative Data Sources	**Number**	**Total Number of Codes Applied**
Preinterview transcripts	4	312
Participant reflection journal entries	72	543
Postinterview transcripts	4	417
Totals	80	1272

These initial codes were refined, merged, and in some cases abandoned in favor of more descriptive wording. The rest of this section describes this analysis process and then presents findings from this analyzed data.

Analysis of Qualitative Data

The first step in analyzing qualitative data for this study was transcribing audio files from pre and postinterviews through an online transcription service. Transcription files were compared to audio recordings to ensure accuracy and clarity. For example, when Amy spoke about her biggest barrier in response to a preinterview question, her response was transcribed as:

> Uh, okay, for me personally is when I'm literally at my kitchen table on Saturday and I'm writing my left, this land, and I know you're coming in that week, and maybe I'm not real sure about how, Because that's what that's kind of been in the back. Mama, I've been worried about, you know, if he's coming in three hours that week, how'm I gonna know how to write this up in a lesson plan? So that was that one. I'm not really worried. I mean, I feel like a kinler.

After listening and comparing, this transcription was revised to more accurately read:

> Uh, okay, for me personally is when I'm literally at my kitchen table on Saturday and I'm writing my lesson plan, and I know you're coming in that week, and maybe I'm not real sure about how to, because that's what that's kind of been in the back of my mind. I've been worried about, you know, if he's coming in three hours that week, how am I going know how to write this up in a lesson plan? So that was…that's one. I'm not really worried. I mean, I feel like I can learn it.

Completed transcripts for both pre and postinterviews were then emailed to each participant as a method of member checking. Emily and Sarah both responded confirming the transcripts were accurate reflections of what was said in the interviews.

I transcribed journal entries from participants' reflection journals into word processing software exactly as entries were written. Participants' entries were combined into a single document with each of their answers under the corresponding reflection

prompt. The original journals were retained for reference as needed had any questions arisen from the transcription. Eight interview transcripts and a single document containing the reflection journal entries were all uploaded into Delve, an online coding software.

I conducted an inductive analysis (Creswell, 2014; Mertler, 2017) of this uploaded qualitative data across multiple cycles of coding. No codes were generated prior to analyzing this data. Prior to beginning detailed rounds of analysis, I read through the interview transcripts and journal entries while identifying relevant segments of text by research question in a process of structural coding (Saldaña, 2016).

During the first round of detailed analysis, transcripts of both interviews and journal responses were highlighted and coded on an individual sentence level. A process of open coding (Bloomberg & Volpe, 2008) linked one or more codes to each sentence capturing the general purpose of what the sentence conveyed. For example, a highlighted sentence from Sarah's postinterview received two codes: "future goal" and "growth" (see Figure 4.1).

I continued subsequent cycles of reading through the qualitative data to apply value codes to capture participants' beliefs and attitudes toward technology while simultaneously applying description codes to identify possible causes when data revealed changes in their attitudes and beliefs (Saldaña, 2016). This yielded codes such as "confidence," "frustration," "failure," and "learner." I also conducted another cycle of coding on participants' postinterview transcripts using evaluation coding to gather participants' thoughts of this coaching model (Saldaña, 2016). This cycle resulted in identification of codes such as collaboration, modeling, role of coach, and support.

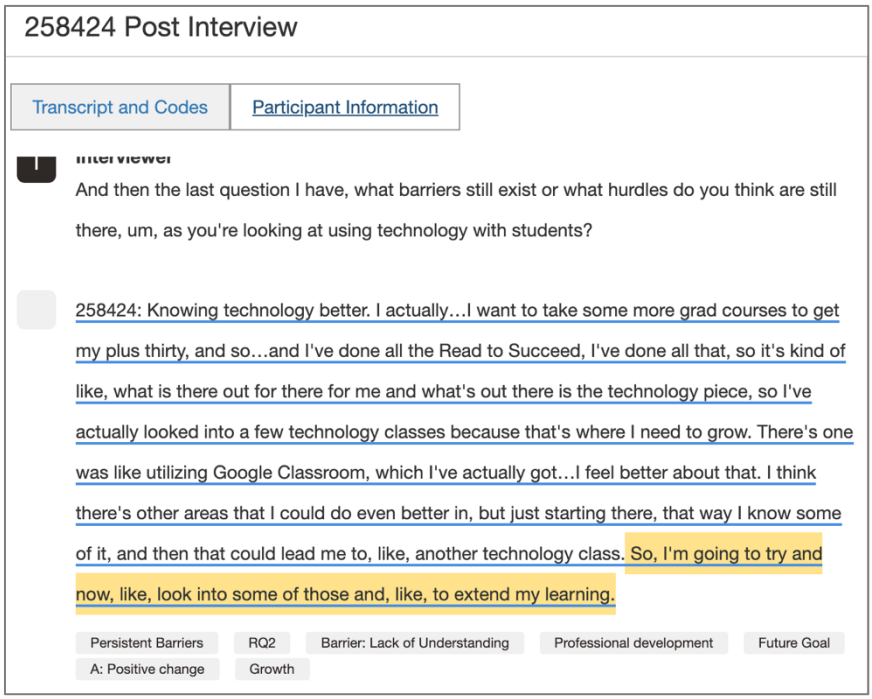

Figure 4.1. Open coding in Delve.

The first round of coding resulted in 1,178 codes. These codes were printed, cut apart, and arranged into broad groupings using tacks and a cork board (see Figure 4.2) in a process of code mapping (Saldaña, 2016). Groupings included barriers, the coaching model, participants' reflections on changes, attitudes, and values. During this grouping process, fourteen coding labels were discarded due to either minimal or inconsequential use for describing participants' experiences (e.g., "stuck" was used once by a single participant and in reference to this participant's attitude toward general incorporation of new ideas, not specific to technology or this intervention).

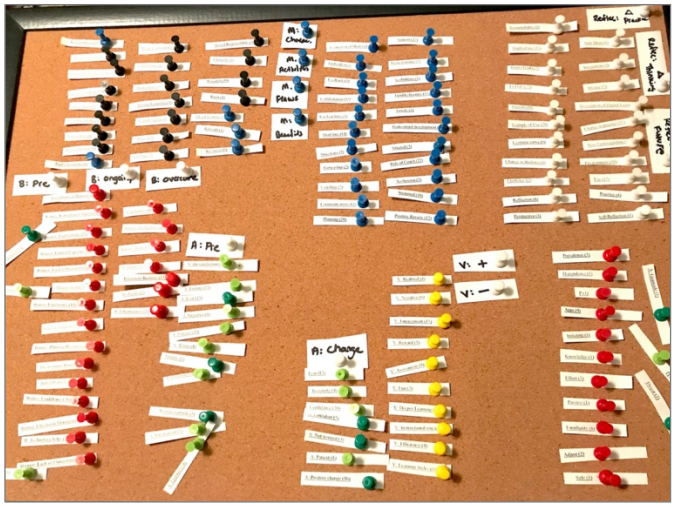

Figure 4.2. Grouped codes.

During a third cycle of coding, I took the unique codes now sorted into groupings and began to refine and combine them by moving them around in Delve. Each time codes were combined, I recorded an analytic memo in Delve to track my thinking, assertions, and analysis about the codes' underlying meaning (Bazeley, 2013; Mertler, 2017; Saldaña, 2016). For example, separate codes for "partnership" and "collaboration" were combined because sentences under each code both identified the same idea of the coach and participant working together through this intervention. During this process, some codes were discarded as participant statements initially receiving the code were divided amongst other codes that more specifically addressed the meaning behind the statements. For example, statements under an initial code label (role of coach) were divided into more specific codes of coaching activities such as "collaboration," "feedback," "modeling," and "support" (see Figure 4.3).

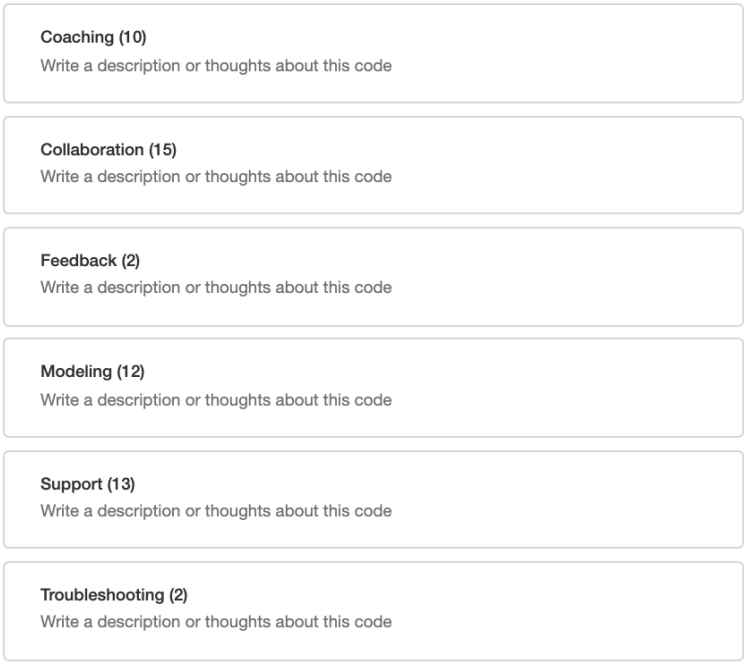

Figure 4.3. Specific codes for coaching activities.

Using analytic memos and more specific codes, I defined clear and distinct categories. One example was the category "changes in practice," defined as a change in how a teacher plans, instructs, assesses, or structures lessons attributable to new learning about technology. Individual codes directly related to this definition were subsumed underneath to form a category (see Figure 4.4).

These initial groupings were refined and recombined using Delve after a peer debriefing session with my dissertation advisor Dr. Grant. One example of this refinement involved me subcategorizing the single category of barriers into preintervention barriers, overcome barriers, and lingering barriers. I initially categorized changes in thinking and changes in practice separately. However, after this peer debrief session, I reorganized to subsume both categories under the larger category of instructional changes to better reflect connections expressed by participants and better align with my tentative assertion that changes in participants' practice did not

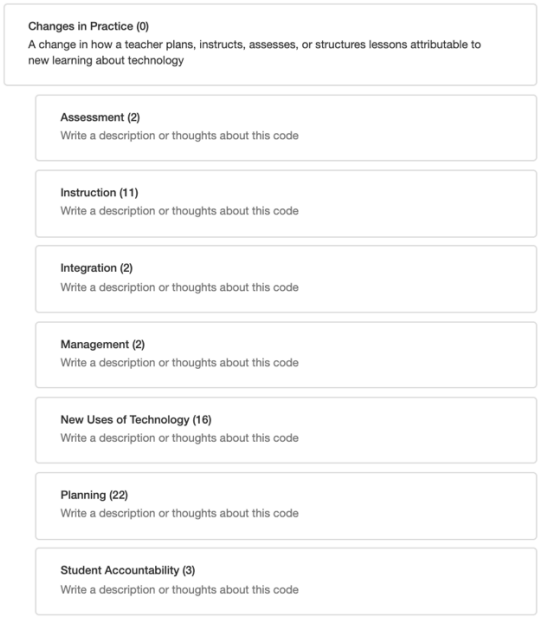

Figure 4.4. Changes in practice category.

consistently correspond to changes in thinking. After this streamlining of categories, I reviewed each coded line to ensure alignment between statement, code, and category. I eliminated some examples under each category during this process for lack of alignment, duplication, or lack of specificity.

Using these refined categories and codes, I began to identify themes and connect them to existing research literature. For example, when reviewing participants' attitudes toward technology prior to beginning this intervention, comments from their preinterview consistently reflected a self-confidence in their ability to learn and a willingness to grow as practitioners. Participants' comments also revealed negative attitudes of fear, frustration, and uncertainty about their technology professional development needs. At the end of this intervention, participants were asked both in a reflection journal prompt and in their postinterviews how their thinking about technology and their instructional planning had changed. In their responses, participants highlighted only positive attitude

changes, including increases in comfort, confidence, and patience as well as decreases in fear and frustration. Comparing statements from before and after this intervention led to the assertion that participants experienced positive changes in attitude toward technology after completing this intervention. I used existing research to support the importance of this assertion, finding support from seven prior studies that teachers' attitudes toward technology is an important factor in their use of technology for teaching and learning. Five subsequent categories were analyzed for themes and assertions using a similar process.

Categories, assertions, subcategories, and supporting qualitative data were organized into a display table (Creswell, 2017). The assertions, categories, and subcategories were shared with participants via email as a form of member checking for accuracy in interpretation. Amy returned an annotated copy with one additional suggestion for inclusion that pertained to her experience. This display table was also shared with Dr. Grant, dissertation chair, for feedback and discussion as part of peer debriefing.

These assertions were elaborated upon through rich, detailed narratives (Mertler, 2017). Each assertion was supported with prior research and participant statements. Each narrative was shared with Dr. Grant for feedback. After I made revisions, these narratives were sent to participants for feedback and to again ensure the writing accurately described their experience.

Presentation of Findings

Six themes emerged from the analysis of the data (See Table 4.10). Through their journal reflections and interviews, participants described (a) changes in attitudes toward

technology, (b) barriers to integration, (c) changes in instructional practices and thinking, (d) effective characteristics of this intervention and impactful coaching activities, (e) their preparedness for fostering a digital learning environment as described by the ELEOT, and (f) unquantified progress. Each of these themes is explained in detail below. Participants are referred to using pseudonyms for confidentiality. Any quotations are verbatim from participants' verbal interview responses or written reflections.

Changes in attitudes. Participants experienced positive changes in attitudes toward technology after this intervention. Previous research identified teachers' attitudes toward technology as an important factor in their use of technology in teaching and learning (Blackwell et al., 2013; Chiu & Churchill, 2015; Ertmer, 2005; Ertmer et al., 2012; Kim et al., 2013; Naaz, 2012, Tondeur et al., 2016). For this study, attitudes toward technology refers to participants' feelings toward technology in general, their sense of personal competency with technology, or their feelings about using technology in a classroom. Participants were not asked directly about their attitude toward technology. Instead, their attitudes were indirectly shared as part of responses to other questions about goals, previous experiences, and barriers. Again, in postinterviews, participants' reflections on changes in practice revealed changes in attitude. Participants' responses indicated (a) an initial mix of attitudes prior to beginning this intervention and (b) positive attitude changes after completing this intervention.

Initial mix of positive and negative attitudes. Because participants had taught for at least one full year with students having access to mobile technology, each had previous classroom and professional development experiences shaping their initial attitudes. Before beginning this intervention, teacher-participants expressed both (a) positive

Table 4.10. *Themes, Assertions, and Categories from Qualitative Data*

Themes	Assertions	Categories
1. Changes in attitude	Participants experienced positive changes in attitudes toward technology after this intervention.	• Initial mix of positive (confidence, willingness to grow, and excitement) and negative attitudes (fear, frustration, and uncertainty) • Positive changes in attitude (confidence, comfort, patience, and decreased frustration)
2. Barriers to integration	Teacher-participants were able to overcome a confidence barrier with newfound support, but the six-week duration of this coaching intervention may not have been enough for removal of other important barriers.	• Preintervention barriers (lack of planning or instructional time, lack of support, past negative experiences, lack of understanding, and lack of self-confidence) • Overcome barriers (confidence and support) • Lingering barriers (classroom management, outside expectations, instructional alignment, and time)
3. Changes in practice and thinking	Teacher-participants cited multiple changes in practice, including (a) planning, (b) instruction, and (c) classroom management.	• Changes in practice (planning, instruction, and classroom management) • Changes in thinking (perspective on technology and definition of technology integration)
4. Effective characteristics of this method and impactful coaching activities	Teacher-participants cited characteristics of this intervention and coaching methods as contributing to a more meaningful professional development experience than past opportunities.	• Effective characteristics (embedded nature, sustained duration, responsiveness, and relational trust) • Impactful practices (modeling, co-teaching, and collaboration)
5. Preparedness for fostering a digital learning	This intervention equipped participants to plan opportunities for	• Participants equipped to plan opportunities for students to use

Themes	Assertions	Categories
environment as defined by the ELEOT	the first digital learning environment indicator but did not adequately prepare participants for designing learning experiences incorporating the subsequent two indicators.	technology for gathering, evaluating, or using information (Indicator G1) • Participants not adequately prepared for designing learning experiences requiring students to research, solve problems or create (Indicator G2) • Participants not adequately prepared for providing students with opportunities to use technology for collaborating or communicating (Indicator G3)
6. Unquantified progress	Participants (a) identified both negative and positive examples of technology's instructional value, and (b) their goals both during and after this intervention reflected a desire to continue progress in their understanding of technology integration .	• Positive and negative values for student use of technology • Participant goals

attitudes and (b) negative attitudes toward classroom technology.

Positive attitudes. Participants demonstrated a positive attitude toward learning how to use technology more in the classroom. An initial positive attitude was an indicator that participants would be more open to integrating technology and trying new instructional methods (Miranda & Russell, 2012; Zhao & Frank, 2003). Participants' preinterview responses to both a question about anticipated barriers and a question about digital learning environments reflected positive attitudes. In their responses, each participant commented on their willingness to grow with confident excitement:

Amy: I feel like I can learn it…I mean, I know I can learn it.

Emily: I want to try new things.

Melissa: I'm hungry for new strategies and techniques to incorporate [technology].

Sarah: I'm open to trying new ideas, and I'm really willing to put my neck out there knowing that this is a safe place for me to make mistakes.

Participants' willingness to volunteer for this study indicated these positive attitudes existed before participants began working with a technology coach. An emphasis on the word *new* in their responses also revealed a desire to replace any negative past or present experiences.

Negative attitudes. Despite positive attitudes about an opportunity for professional learning through this intervention, participants also initially expressed negative attitudes in relation to their personal competency with technology and past experiences using technology in the classroom. When teachers who lack confidence view technology integration through a lens of personal skill deficiencies, fear and anxiety mount (Nebbergall, 2012; Radecki, 2009). A lack of confidence emerged in journal entries during the first week when participants were asked what they hoped to accomplish during this intervention and during the second week when participants were asked about their biggest fear when planning for student use of technology. For example, each participant felt uncertainty paired with self-proclaimed shortcomings:

Amy: I tend to be anxious that I have not sent something out correctly [in Google Classroom], or that the students aren't going to receive it.

Emily: I lack a wealth of knowledge surrounding digital learning, because I have avoided its use for fear of failure.

Melissa: I know there [are] many things that I need, but sometimes when you don't know, you don't know that you don't know.

Sarah: My biggest fear is that [the technology] will not work, and I won't be able to resolve [the problem], causing the lesson or activity to fail.

Participants' comments did not cast a negative attitude toward the technology itself, which may have led to greater reluctance when working with a coach. Instead, their comments identified a need to build personal confidence in their technological competencies as a way to foster positive changes in attitude.

Positive changes in attitude. Pittman and Gaines (2015) suggested positive changes in attitude, as realized in this study, could be achieved through targeted professional development. Journal prompts during the first and fourth weeks of this intervention asked participants how they found themselves responding when technology does not work as anticipated. Emily contrasted the two reflections, "I've had some recent issues with technology, but I've grown more patient with myself and the technology." During postinterviews, teacher-participants were asked to reflect on both changes to their instructional planning and barriers they were able to overcome as a result of their work with me. Two participants expressed positive changes in attitude toward classroom technology, as marked by an increase in confidence and a decrease in frustration levels:

Amy: I feel like I have got more confidence and that makes me want to use it more.

Sarah: Before, I would get frustrated if something failed or if I just wasn't capable, and I didn't want [my students] to see that. Now I'm just not worried about that anymore.

Through this intervention, participants better understood technology integration proficiency takes an extended length of time. Melissa reflected, "While I feel my instruction included various uses of technology, there's always room for growth." No longer succumbing to impatience or frustrations, as indicated by Emily and Sarah,

participants developed a more positive attitude toward their current abilities and the personal growth they had seen over the six-week period. This acceptance and understanding of the long-term process mirrors findings from previous research on how teachers overcame negative attitudes toward technology integration (Durff, 2017).

Additionally, a succession of positive experiences, as participants had during this intervention, possibly contributed to developing more positive attitudes (Burke, 2014; Gulbahar & Guven, 2008). Amy recapped her positive experiences when she wrote, "Because I've had the training from a coach, I can now successfully use Apple TV, deliver and attach things in Google Classroom, make Google Forms (and spreadsheets with grades), and use the Money Pieces app." Multiple participants commented on the dedicated technical support provided for troubleshooting device and display issues, which has also been linked to a positive shift in teacher attitudes (Ifenthaler & Schweinbenz, 2013a, b). Amy recognized this change in her attitude, summarizing her experience by saying, "I would definitely say I don't think of [technology integration] so negatively."

Participants initially shared a mix of both positive and negative attitudes toward technology, but experienced positive attitude changes after six weeks of working with a technology coach situated in the school. Similar to previous studies (Blackwell et al., 2013; Chiu & Churchill, 2015; Ertmer, 2005; Ertmer et al., 2012; Kim et al., 2013; Naaz, 2012, Tondeur et al., 2016), this study's participants' shift toward more positive attitudes accompanied an increase in technology usage.

Barriers. Teacher-participants were able to overcome a confidence barrier with newfound support, but the six-week duration of this coaching intervention may not have been enough for removal of other important barriers. This suggests participants' lack of

self-confidence and fear of technology were most quickly overcome with structured, consistent support (An & Reigeluth, 2012; Burke, 2014; Durff, 2017; Ertmer, 1999; Ertmer et al., 2012; Hsu, 2016; Laferrière et al., 2013). In this study, a barrier is defined as an external or internal factor cited by participants as an impediment to technology integration and student use of technology. To uncover initial barriers, participants were asked in their preinterview what they perceived to be a barrier for us to overcome while working together, though other barriers also emerged in responses to questions about past experiences and participants' goals in this study. To assess which barriers were resolved as a result of this intervention and which persisted, participants were asked in their postinterview if there were any barriers they felt they were able to work through as a result of their participation and which barriers still exist for them. Participants' responses indicated (a) an initial mix of both first- and second-order barriers, (b) an overcoming of an initial barrier of a lack of self-confidence, and (c) lingering first-order barriers.

Initial mix of first- and second-order barriers. Teacher-participants cited a wide range of initial barriers stemming from past experiences with technology. While participants identified both (a) first-order barriers and (b) second-order barriers, more of the latter were identified at the beginning of this intervention.

First-order barriers. First-order barriers (Ertmer, 1999) included a lack of planning or instructional time and a lack of support. Time weighed heavily on participants' minds as an impediment. This mirrors findings from previous studies which found factors related to time as a barrier to initial integration efforts (Ertmer et al., 2012; Hsu, 2016; Pittman & Gaines, 2015). Amy emphasized concerns about time, saying, "I don't have time, you know? Then I've lost my time and I don't have much time." Melissa

expressed a similar sentiment about barriers, citing "I think that time is the biggest." Emily felt a squeeze of instructional time lamenting, "Science and social studies, you know, you run into it turns into a lecture hall and you're just trying to teach it as fast as you can." Teacher-participants began this intervention already concerned about a lack of time. Helping participants overcome this barrier would require showing how to integrate technology with existing practices without added time demands.

Even though the district employs two technology coaches, participants did not feel fully supported in their technology integration efforts. Sarah expressed confusion about these coaches' role, saying, "I guess I hadn't really been sure how else to utilize them and what role they maybe play in planning teaching. I specifically see them more as, like, troubleshooting." Amy was succinct in her assessment when asked to what degree she had utilized the district's coaches, replying, "I don't even know who they are." Current staffing levels and responsibilities do not allow district technology coaches enough time to develop personal working relationships with teachers focused on instructional practices. Two coaches are tasked with providing integration support and professional development to over 600 district teachers while also responsible for assisting with troubleshooting and technology support, managing mobile devices for teachers and the district's nearly 9000 students, overseeing district computer labs, designing, planning, and facilitating the district's digital learning program during inclement weather, and fulfilling any additional supervisory duties as part of the district's instructional division. Therefore, when these coaches do have opportunities to interact with teachers, it is brief and often through large-scale meetings, through mass email communication, or related to device management or troubleshooting concerns. "In practice, coaching roles often

involve a delicate balance between peer coaching or mentoring responsibilities and whole-school improvement or system-wide professional development" (Gallucci et al., 2010, p. 922). This balance between roles (Knight, 2004) is contingent on whether coaches are placed at a school or district level (Gallucci et al., 2010; Norton, 2001). As County School District's technology coaches operate at the district level, their ability to coach and mentor individual teachers is limited due to other responsibilities.

Second-order barriers. A long list of second-order, or internal, barriers (Ertmer, 1999) included participants' past negative experiences with technology, a lack of understanding of how to integrate technology and the digital learning environment described by the ELEOT, and a lack of self-confidence. Participants shared multiple past negative experiences with student use of technology. As Emily described, these experiences bred a fear of failure when planning student use of technology. Amy's fear was realized while attempting a Google Expedition:

> It was awful. And then when we got on [Google Expeditions], we knocked [the teacher next door] off of it. I didn't know she was on it. Nobody could pull [the expedition] up under my name. It was pulling up under her name. And we tried it three or four times when we were doing the water cycle, and I finally was just like, no, not going to do it. We're done. And I gave up.

Melissa referenced a similar past experience, saying, "I tried to develop [a Jeopardy game] last year and it flopped tremendously." For participants already feeling pressed for time and ill-supported, these negative experiences reduced their likelihood to pursue similar technology-based learning activities because, as Emily wrote, "it just continues to make me nervous."

Though this district has used the ELEOT in classroom observations for multiple years, participants still expressed a lack of understanding about district and school

expectations for how a digital learning environment looks and sounds. Sarah wrote, "I find it most difficult to plan for students to communicate and collaborate when using digital tools. The area of communicating is most difficult because I'm not sure what that looks like." At the close of her preinterview, Sarah also shared a need for support in understanding the digital learning environment, saying, "Sometimes I don't know what that looks like or ideas to get that." Amy also spoke about student collaboration and communication when she said, "I'm not really sure how to incorporate that in a lot of the things." Participants did not lack for descriptive explanations of the ELEOT indicators or lists of technology strategies and resources. In addition to receiving copies of the ELEOT descriptors in their staff handbook, participants have received additional descriptions as part of monthly classroom observation feedback, such as this statement about indicator G2, students using technology to research, solve problems, or create original works, "Open-ended tasks help provide the flexibility for this kind of digital learning to occur. Common creation apps include Book Creator Free, iMovie, Pages/Google Docs, KeyNote/Google Slides, Padlet, and PicCollage." Participants' lack of clarity appeared to stem from not having seen classroom-based applications in action. Sarah said, "Sometimes I don't know what [a lesson meeting the ELEOT indicators] looks like or ideas to get that." Amy focused on students using technology to communicate or collaborate, but expressed similar concern, "I still have a hard time with the collaborative part of that [indicator]."

Participants expressed a lack of confidence in their own ability to use classroom technology. In explaining her goal during the preinterview, Amy said:

> I hope to learn how to use the technology that I have, how to use it, period, and how to get it into lessons more frequently and feel good about it – not

> scared. That's the big one…to be able to do it and to feel like I'm doing it confidently.

Emily hoped for something similar in her preinterview: "I think one of my biggest hopes with doing this study with you is to learn not to be as hesitant with technology as I am." While there may be some fear associated with the device itself, participants frequently used their personal phones which operate similarly to the student devices. Rather, their fear likely stems from changes they know will need to occur with instructional practices (Rickard, 1999) and the unknown outcomes associated with new learning activities (Noblitt, 1998). This lack of confidence needed to be overcome before for sustained pedagogical change after this intervention and coaching support ended.

Teacher-participants came into this study facing many first- and second-order barriers. The question would be whether this situated coaching intervention would effectively address these barriers and remove them as impediments to technology integration.

Barriers overcome. A barrier was overcome when a barrier initially cited by participants as an impediment to their integration of technology but was later described as ceasing to be an inhibiting factor after participants completed this intervention. Teacher-participants described (1) a lack of self-confidence and (2) a lack of support as two barriers resolved as a result of this intervention.

After six weeks of working with me as a technology coach situated in their school, multiple participants noted feeling more confident using technology.

> Amy: And now I'm not as scared....It's helped, made me more confident. It's made me feel like even if I try it and fail it, I at least tried it, and I have a better understanding of how to do it.

Sarah: Honestly, I'm not, like, fearful of trying out technology.

Emily: I used to be very hesitant with technology because of the fear of anything breaking down within the process of the lesson….but since I've had to use it more in the six weeks and even after that, since I've used it more, I've gotten more comfortable with it so when there's an issue of any kind, or a kid doesn't understand a certain aspect of it, I feel more comfortable assisting them.

This supports research showing modeling of technology integration in content-specific areas by technology-integrating peers, mentors, or technology coaches increases teachers' confidence and comfort (Brenner & Brill, 2016; Ertmer, 1999; Gronseth et al, 2010; Kumar & Vigil, 2011; Polly et al., 2010). Working alongside teacher-participants as a coach, even just for six weeks, allowed participants' lack of self-confidence to diminish when planning integration opportunities. Postintervention observations would reveal whether this newfound confidence was contingent on the presence of a coach or if participants placed confidence in themselves as practitioners.

Participants also referenced a higher level of support as a result of participating in this intervention, leading them to push through a previously described barrier. Job-embedded professional development with the sustained presence of a coach or mentor offers needed support not found in short-term approaches to professional development (Hunzicker, 2011; Pettet, 2013; Swan & Jennings, 2002). Melissa said, "Having a technology coach meet with me to discuss my needs and questions has been amazing." Amy referenced a dissipating level of frustration knowing support would come back to the classroom within a couple of days of running into a problem. Removing this barrier increases probability of changes to practice because "when teachers feel supported, they

are more willing to take professional risks by trying new things" (Hunzicker, 2011, p. 178).

Lingering barriers. A lingering barrier refers to barriers cited by participants as still impeding their integration of technology and which completion of this intervention did not remove. While some second-order barriers decreased as a result of working together, the number of first-order barriers cited actually increased between the pre and postinterview sessions. Participants cited (1) classroom management, (2) outside expectations, (3) instructional alignment, and (4) time as lingering barriers.

Classroom management. Classroom management concerns were raised by participants as a barrier to more independent student use of technology. This study took place as media covered the online Momo challenge in videos, where children were reportedly encouraged by a masked character to complete dangerous tasks (Lewis, 2019), and the potential risks of associated content. This fear captured Amy's attention: "With all the stuff that happened like with Momo and things like that, I have been extra cautious about making sure I can watch what [students] are doing." Sarah addressed a similar fear when she explained, "I also fear students accessing inappropriate information or images when they are working independently or when accessing something new." While previous studies also cited concerns about student behavior as a barrier to integration (An & Reigeluth, 2012; Seemiller, 2017), another previous study found behavior problems decreased when students used technology in learning (Ottenbreit-Leftwich et al., 2010). Students' on-task behavior when using technology depends on how well given tasks cognitively engage learners (Dennis, 2013). Continued fears about classroom management will prevent participants from moving beyond content delivery through

structured learning experiences to more student-centered activities such as research, creation of learning products, and digital collaboration.

Outside expectations. Participants frequently spoke about trying to meet expectations associated with classroom observers and the ELEOT. Emily internalized the need to live up to others' expectations:

> I beat myself up a lot, because I'm self-conscious about everything that goes on in the classroom when I am in front of someone. I know that I need to learn how to better embrace that "messiness" because it is expected with student learners, but I think it's something I will always grapple with when I have someone in my room.

Amy, Sarah, and Melissa, on the other hand, looked at others' expectations as an external bar to reach. When asked about lingering barriers, Amy answered, "Trying to hit the [indicators] that we're supposed to hit during [classroom observations]." Melissa similarly responded, "sometimes it is frustrating when you work so hard and you don't get any points for [your work] or you get one point, which means not observed." Concern with meeting others' expectations also appears in multiple previous studies (An & Reigeluth, 2012; Becker & Riel, 1999; Durff, 2017; Sandholtz, 2001) as potentially a positive or negative determiner of teaching practices. If expectations are perceived to be unrealistic or overwhelming, they become a barrier to integration efforts (Durff, 2017). Based on this barrier, participants' new confidence in their technological capabilities did not translate to confidence in current instructional practices' sufficiency meet perceived high administrative expectations.

Instructional alignment. Participants expressed difficulty finding technology-based instructional materials that aligned with grade-level content and were age-appropriate. Amy lamented a lack of fit between student use of technology and content:

"[Technology] doesn't lend itself as much with what we're doing right now, because we just started capacity." Emily pinpointed finding age-appropriate material to be difficult when she said, "I can find things that are beneficial to a high school student, but the readability of it is not compatible with the group of children that I have in my room." Such resources likely exist, though difficult to locate, possibly indicating the barrier is not resources themselves, but rather the time and energy required to locate them. Teachers who expressed similar difficulties in a previous study (Durff, 2017) overcame this barrier through changing pedagogical methods, reviewing apps and platforms prior to use with students, learning and sharing ideas and strategies with peers and technology conference presenters, and direct professional development on how to find and locate resources.

Time. A lack of time persisted as a barrier between pre and postinterviews. Comments about this barrier indicate time affects multiple aspects of integration, including impacting their ability to search for needed technology-based instructional resources (Emily), the amount of instructional time they were willing to devote to student use of technology (Amy), their ability to pursue additional professional development (Sarah), and peer discussion about instructional practices (Melissa). Time's high frequency as a code remained relatively unchanged from pre to postinterviews. This finding mirrors previous research which found teachers' perceptions of time to remain negative both before and after a school technology facilitator intervention (Kopcha, 2012). Melissa offered a suggestion for why, stating "Well, we can't add hours to the day." The time required can be mitigated by incorporating student use of technology with existing school goals and expectations and reducing teacher workload in other areas, but

time will persist as a barrier with changes in instructional methods and tempt teachers to revert to previous practices (Hartley, 2014). With multiple competing instructional priorities and a finite amount of time for both planning and instructing, this barrier may prove to be the most difficult to overcome for sustained pedagogical change.

Of the many barriers identified prior to this intervention, this situated coaching model only helped participants sufficiently overcome a lack of self-confidence and a lack of support. While the four lingering barriers of classroom management, outside expectations, instructional alignment and time were points of coaching conversation during the intervention, they were not removed and, in fact, were only fully realized as barriers at the end of this intervention. This may be attributable to participants being more acutely aware of these barriers only after they began integrating technology more frequently. Regardless, this model could only remove some barriers in the six-week duration.

Changes in practice and thinking. This intervention led to changes in instructional practices, but it was less effective at changing participants' underlying understanding about technology integration that would contribute to more enduring changes. The teacher-participants experienced changes in their instructional practices and simplified their thinking about how technology could be integrated. For example, one participant's thoughts shifted from a focus on merely using technology to a focus on how the technology is used. While it is possible to increase teacher use of technology without making corresponding changes to instructional practice (Ertmer, 2005), fundamental changes in practice are necessary for learning to meet students' needs (Burke, 2014; Collins & Halverson, 2009; Desimone & Pak, 2017; Idrus & Ismail, 2010). Factors such

as teacher efficacy, professional development through on-the-job learning, coaching, and collaborative discussion are associated with changes in practice (Coburn & Woulfin, 2012; Parise & Spillane, 2010; Sailors & Price, 2010; Steckel, 2009; Tschannen-Moran & McMaster, 2009). Participants were asked directly in their postinterviews for examples of changes to instructional practices. A journal prompt encouraged participants to reflect on changes in their thinking about planning for and implementing student technology use. Participants' responses indicated (a) changes in practice and (b) changes in thinking, with both coming as a result of this intervention.

Changes in practice. For this study, a change in practice was defined as a change, attributable to new learning about technology, in how a participant planned, instructed, assessed, or structured lessons. Teacher-participants cited multiple changes in practice, including (a) planning, (b) instruction, and (c) classroom management.

Planning. One change in practice was how participants planned lessons differently as a result of working with a technology coach. Clark and Peterson's (1986) definition of planning provides a foundational understanding of this process:

> Teacher planning includes the thought processes that teachers engage in prior to classroom interaction but also includes the thought processes or reflections that they engage in after classroom interaction that then guide their thinking and projections for future classroom instruction. (p. 258)

Teacher planning and the associated thought processes are an important determinant of whether technology is used and to the quality of integration (Angers & Machtimes, 2005; Jones & Moreland, 2004). Teachers may see technology integration as something tacked on to the end of the planning process instead of something interwoven throughout, inhibiting their ability to plan for effective technology use (Yelland, 2005). Most of the participants in this study not only began to plan differently as a result of this intervention,

they also began to view the entire lesson planning process through a lens of technology integration. For example, the four teacher-participants noted changes in their thought processes while planning:

> Amy: I felt like when we talked about [technology integration], it helped me know what I needed to learn better to do, or that I was on the right track…like when we were planning that we were really thinking about what can I really do.
>
> Emily: The biggest area of growth for me so far has been the change in thinking about content and how I'm going to introduce that material…I've spent more of my time thinking about student engagement. I think I pay more attention to the technology aspect of it now because it was something that was on my radar during those six weeks.
>
> Melissa: I think more outside of the box. There was something good in…talking through the plans because, you know, after you've done it so many years, you can get in a rut.
>
> Sarah: My biggest area for growth is better understanding the technology expectations of the ELEOT tool and being able to plan lessons to meet those expectations.

One strategy used in this study to change how participants thought about planning was to introduce them to the Triple E Framework (Kolb, 2017) which challenges users to reflect on how strategic integration of technology can contribute to the engagement, enhancement, and extension of learning goals. I sought to shift participants' thinking of technology from a task-based lens to a goal-based lens in alignment by providing them a template to model thought processes. This strategy aligned with previous work by Jones and Moreland (2004) which found teachers changed their thinking gradually over time with the support of a planning template. Sarah shared, "Looking ahead, when planning lessons that implement technology, I plan to use [the Triple-E Framework], the guiding questions we discussed, and searching for digital lessons when looking for ideas as my

guides for planning technology use." Her new outlook on planning may lead to higher quality instances of technology integration, but as discussed later, may not sustain long-term changes to without an associated change in conceptual thinking.

Instruction. A second change in practice was how participants facilitated classroom instruction. In this study, instruction refers to both how students acquire new information or skills, as well as how students use and make sense of the new information and skills. Professional learning in a job-embedded context has been associated with changes in instructional practices (Parise & Spillane, 2010), particularly when a teacher receives coaching (Desimone & Pak, 2017; Heineke, 2013). Participants referenced examples of how their instruction changed as a result of this coaching partnership.

Amy:	Bottom line: I didn't even know how to access Apple TV four weeks ago, and Friday I was successfully using it on my own to introduce a new concept.
Emily:	I've also integrated a lot more with [online platforms], kind of those technology tools to help them review materials. And beforehand when I would review something, I don't think I ever thought of using technology as a way to review.
Sarah:	After our lesson of the vending machine in math, I now have students doing more with creating and solving math problems in their whiteboard app and collaborating when solving.

These above examples are not lesson-specific, but rather point to instructional changes with potential for routine application for both student and teacher use of technology. The latter two examples combine to address all three ELEOT indicators with students using information (review activities), creating (math problems), and collaborating (when solving math problems). Participants' consistent replication of these instructional changes across multiple contexts will indicate these are lasting changes and not isolated examples (Grossman et al., 2009).

Management. A third change in practice was how participants exercised classroom management techniques when students were using technology. For teachers first integrating technology into teaching and learning, classroom management concerns emerge and require new routines, procedures, and strategies (Ertmer, 1999; Morrison et al., 1999; Sandholtz et al., 1997). While not a focus of this study, two participants identified promising management techniques they will incorporate as a result of their participation. Melissa explained, "Now that I have thought about this challenge, maybe highlighting the other [student] experts in the room could provide the learners with more support." Sarah highlighted a strategy to keep students more on task during instruction, saying "I got a lot of ideas…[like] when we introduced this new money app, let's start a timer for two minutes and let them play around with it so we can get that out of the way." Recognizing and proactively planning for classroom management challenges during the lesson planning phase aids in executing instructional changes.

Changes in thinking. While participants changed the planning, design, and delivery of instruction, comments also revealed changes in their underlying conceptual thinking about technology integration. Research has shown site-based coaching can facilitate reflection as part of the professional development model (Heineke, 2013). Reflection also helps teachers extract learning from their experiences, thereby continuing a form of personal professional development (Kayapinar, 2016; Reis-Jorge, 2007). Teacher reflection on instructional practices and new professional learning can lead to changes in thinking (Dewey, 1933; Heineke, 2013; Richardson, 1994). Teacher-participants identified shifts in (a) their perspective on technology and (b) their definition of technology integration as a result of reflection opportunities built into this intervention.

Perspective on technology. Participants' perspective on technology in the classroom was a first change in thinking through this intervention. Teachers new to technology integration who participate in related professional development opportunities can face changes to their pedagogical understanding and instructional practices. Such changes can result in a perspective shift such as approaching teaching from a teacher-centered to a student-centered perspective (King, 2002). Participants in this study referenced general perspective shifts as a result of participation in this intervention. Melissa shared how working with me offered her a new perspective when she said, "There was something good in all of it, but…to have another perspective, another idea, because sometimes when you're in the trench, you can't really see what's above the hole." Amy explained her thinking about planning and integrating technology changed as a result of her new abilities. She wrote in her journal, "I have more ability now so my thinking has changed some…I would definitely say I don't think of it so negatively and I depend on it now…for more collaborative learning." Emily described her own change process:

> [Before this intervention] you don't think about other people's perspective or a technology perspective…So having the prompts each week, the three different prompts to reflect on — it just gave me a different perspective of myself as a teacher, and I think that was beneficial to me because this is a practice where you have to constantly reflect in order to improve."

A situated coaching model led participants to new vantage points from which to view their current practices. This shift in perspective is a prerequisite to changes in understanding.

Defining technology integration. A second change in thinking altered how participants defined technology integration. Solely being able to see technology

integration from someone else's perspective does not necessarily indicate a personal change in understanding. Rather, a change comes from a process of internally comprehending alternative perspectives and assimilating new knowledge with existing understanding (Borko & Putnam, 1996; Hughes, 2005). Fewer participants spoke to a personal change in their definition of integration as a result of this intervention. Emily's new understanding came when looking at the meaning of technology integration, noting:

> I thought…there's only these certain sites that we can use and if we don't use these certain [platforms] and accomplish the certain tasks with [technology], then it doesn't count as technology integration, but I've learned throughout the six weeks that that's not true.

Sarah reflected, "Before this work, my thinking about technology and ideas were more complicated, and I've realized something like designing a website isn't what we're looking for to meet technology implementation expectations." Participants' definition of technology integration broadened as they no longer thought of integration in terms of large, culminating tasks for students and began to see how technology could be integrated with the entire teaching and learning process. With this understanding internalized, participants are now changed as practitioners even after coaching ended.

Each participant's classroom looked different as a result of participating in this intervention because of new planning, instructional, and management processes. For adult learners, however, lasting change comes when professional development changes both intellect and personal understanding (Knowles, 1973; Stein, Ginns, & McDonald, 2007). This study was more effective at changing practices (intellect), but not as effective at changing understanding, suggesting some expressed changes may not lead to enduring professional growth.

Participant reflections on intervention. Teacher-participants cited characteristics of this intervention and coaching methods as contributing to a more meaningful professional development experience than past opportunities. Though this intervention did not achieve the desired change in practice as measured by ELEOT indicators (see "Part One: Quantitative Analysis and Findings"), findings from participants' reflections support previous research on effective professional development and cognitive apprenticeship theory (Blank, 2013; Brown et al., 1989; Garet et al., 2001; Hunzicker, 2011; Johnson et al., 2017; McLellan, 1996; Pettet, 2013). Participants were asked directly in their postinterviews (a) what characteristics of this intervention they valued most, and (b) which practices were most useful to them.

Characteristics. Participants reflected on several characteristics of this intervention. Characteristics of this intervention referred to structural design features in how the situated coaching model was planned and implemented. Previous studies identified several key characteristics of professional development present in this intervention (Garet et al., 2001; Harris & Muijs, 2005; Hunzicker, 2011; Pettet, 2013). Participants felt specific characteristics of this model contributed to a more meaningful professional development experience. When asked what they found valuable in this experience, participants identified the (a) embedded nature, (b) sustained duration, (c) responsiveness, and (d) relational trust formed during the intervention, which align with characteristics of professional development.

Embedded nature. A first characteristic participants found valuable was this intervention's embedded nature. The embedded nature of the intervention made an impact on teachers' interpretation of the experience because the professional

development came to their school and classroom, rather than requiring them to go to a centralized location for training in a lab or meeting space (Carter, 2008; Hunzicker, 2011). For many of the participants, having someone close at hand proved useful for answering questions and purposes of accountability in implementing new learning. When participants were asked a postinterview question about what coaching practices they found most useful, three cited the embedded nature in their response:

> Amy: I know how busy you are, but I felt like…I can ask him because he's in here for…technology.
>
> Emily: Having you come in during that time was beneficial to me, because again, having you here, it gave me a sense of, I mean, I had to be accountable for what we had planned, but also I knew that if something were to falter, I did have someone that I could kind of work together with, and then we could move through that and continue the lesson.
>
> Melissa: Most useful, I would think would be…having you come in…I thought it was very effective having you here on site.

Hunzicker (2011) wrote about job-embedded professional development being more relevant for teachers as learning is interwoven throughout the day through a coaching and mentoring process. "Such learning activities require teachers to consider possibilities, try new things and analyze the effectiveness of their actions" (Hunzicker, 2011, p. 178). Emily alluded to this requirement in her comment about accountability. By bringing professional learning into the classroom, teachers felt a greater impact on changing their practices.

Sustained duration. A second valuable characteristic identified by participants was the sustained duration of working with a coach. The sustained duration of the professional development was different from other district opportunities. Other professional development options in the district last for one or two hours, and the most

sustained model, cohorts, lasts for twelve hours total over the course of the school year. Research suggests a longer duration allows for more in-depth discussion of new professional learning, as well as time for teachers to implement new strategies and receive feedback on their efforts (Garet et al., 2001; Pettet, 2013). The current intervention lasted six weeks, but all participants expressed a desire for an even longer duration. For example, when asked a postinterview question about how the intervention could be improved in future iterations, they said:

> Amy: When I realized our six weeks were up, I was like, oh, I want to do six more weeks.
>
> Emily: As a coach coming in only two or three times a week, you only see those two or three lessons, so you don't necessarily see the bigger picture. But if you stayed for a unit in a particular subject the entire time, I think it wouldn't only be rewarding to me as a teacher, because we had a partnership, but it would also be rewarding because you would see what benefit the model has had on the kids as well.
>
> Melissa: I wanted to keep you for another four weeks.
>
> Sarah: I would be willing to keep it going and do more if that was possible or necessary.

Participants' comments indicate they recognize the positive impact this intervention had on their classroom practices but realized more could be accomplished with a longer duration. Blank's (2013) meta-analysis of professional development research found for studies with a significant positive effect of new teacher learning translating to student achievement, teachers were involved in the professional learning for an average of six months, with some participating for as long as sixteen months. Though longer than many workshops and more contact hours than any other professional development opportunity

offered to teachers through the district, a longer duration was both desired by participants and may have led to more significant changes to instructional practices.

Responsiveness. A third valuable characteristic of this intervention was my ability to quickly respond to participants' needs. A responsive coaching process is one driven by teacher and student needs as they emerge through reflection (Ippolito, 2010). Responsiveness is a valuable feature because participants typically have to wait until an available faculty meeting to receive requested help, wait for a summer workshop, or add their requests when creating a new annual school or district professional development plan. Much of the interactions in this intervention, such as co-planning and co-teaching, were more responsive in nature whereas other more commonly available workshop or presentation formats are more directive (Ippolito, 2010). A responsive approach also allowed participants to take a more active approach in learning because they directed the practices to best meet their needs (Desimone & Pak, 2017). While only Amy mentioned this facet, her concern about time in general was softened by "knowing I will get clarification on [a technology question] soon." Again later, she described how her "daytime schedule is planned to the nth degree, so it helps to know I can get help soon from someone who will know." Research suggests when professional development is responsive to teachers' needs and goals, there is a greater likelihood of changed instructional practice (Borman & Feger, 2006; Costa & Garmston, 2002; Dozier, 2006; Garet et al., 2001; Hargreaves & Fullan, 1992). Amy contrasted this experience with a previous professional learning cohort session on learning iMovie: "You came to our cohort and you made us make iMovies and everybody else was just doing it, but you didn't teach us how. You just made us learn as we went…I just remembered I was, like,

so panic-stricken that entire hour." For Amy, who came into this intervention with the least experience with classroom technology, a responsive approach meeting her individual needs and answering her specific questions was both more reassuring and more effective at inducing change.

Relational trust. A fourth valuable characteristic was relational trust formed prior to and strengthened during this intervention. As noted earlier, the participants either do not know who the current district technology coaches are or have only worked with them in a limited fashion for technical support. Teachers do not have opportunities to build a trusting relationship with a district coach. Researchers point to coaching within a school building leading to relational trust because administrators and teachers are working toward a shared goal of student outcomes (Frank et al., 2004; Kondakci et al., 2017; Liu & Hallinger, 2017; Parise & Spillane, 2010; Penuel et al., 2007). Assuring participants prior to this study that this intervention would "confidential, nonevaluative, and supportive" (Habegger & Hodanbosi, 2011, p. 36), fostered an increased level of trust as well. This aspect was influenced by my insider status (Herr & Anderson, 2005), having been both the current assistant principal and the previous elementary technology coach. I had collaborated with these participants multiple times over preceding years and had months of working in the building on a daily basis to build relational trust prior to the start of this intervention. A new coach would need to spend time forming these relationships before teachers trusted them in the same way. Sarah explained how this trust made her feel safe: "I'm open to trying new ideas, and I'm really willing to put my neck out there knowing that this is a safe place for me to make mistakes." Emily was more willing to challenge herself, noting "If I were left to do [technology integration] all alone,

I don't think I would have taken the leap into certain things because it went beyond my comfort zone." This kind of relational trust takes time to develop and requires more frequent opportunities for interaction than other professional development methods afford. Situating a coach in a school better provides the time and opportunities for interaction necessary for forming this trust.

Practices. A second area participants reflected upon was what took place during the six weeks coaching. Unlike characteristics of the model itself, practices referred to the activities both coach and participants engaged in while working together. Participants cited multiple phases of a cognitive apprenticeship model (Collins et al., 1989) and situated learning (McLellan, 1996) in their responses, supporting the effectiveness of this method of knowledge transmission. While many coaching strategies were used during these six weeks, teacher-participants felt (a) modeling, (b) co-teaching, and (c) collaboration were the most impactful practices.

Modeling. One practice that participants found useful was modeling. Modeling involves demonstrating activities in the classroom context (Collins et al., 1989). Two participants appreciated the opportunity to observe me leading a portion of a lesson while they took notes on teaching moves to incorporate in their own instruction. Sarah explained the active learner role she still adopted during periods of modeling, "It really wasn't…a matter of like, I'm going to let him do [the technology] part and I'll do the academic part, but I'm more of a visual learner, and so…I needed to see how somebody might roll out a new app or a new site." Amy described a similar experience:

> I felt like getting to watch you model the two weeks that you did with the SchoolKit Math and the way you were able to put their [work on the classroom display] and then kind of guide them through what they were doing, I kind of copied that after your two weeks of being done in math.

Previous research also suggested modeling by mentors encouraged technology use (Bell et al., 2013; Brenner & Brill, 2016; Fullan & Knight, 2011; Kariuki et al., 2001; O'Neal et al., 2017; Poglinco & Bach, 2004). For participants initially facing a barrier of a lack of self-confidence, modeling allowed time for participants to learn alongside their students while being introduced to new integration techniques. Cognitive apprenticeship uses modeling to transmute learning from expert to apprentice. "To learn to use tools as practitioners use them, a student, like an apprentice, must enter that community and its culture. Thus, in a significant way, learning is, we believe, a process of enculturation" (Brown et al., 1989, p. 33). Modeling provided a pathway for participants to enter the culture of technology integration.

Co-Teaching. Participants identified co-teaching as a second useful practice. Co-teaching experiences involve both the coach and participant teaching a lesson together. Co-teaching encouraged participants to try new instructional strategies while still having active support in the room to reinforce teaching moves and provide extra support to students using technology. Previous research supports co-teaching as a way to increase teacher commitment to new learning and change instructional practices as teachers see the authenticity to the coaching process (Heimer, 2017; Killion & Harrison, 2005; Seid, 2017). For two participants, having a second person in the room as active support in leading lessons was advantageous. Amy explained, "The co-teaching, I just thought, was really fun because it was…almost like tag-teaming a really hard subject two different ways." Emily appreciated the assistance introducing a new strategy as she said, "I'm a big fan of [co-teaching] because you can just bounce off of each other and then eventually scaffold into…let me hand this over to you and see what you can do with it,

and then I apply [the strategy] and implement it myself." For participants, having a coach teaching alongside them was a support they could lean on when confidence wavered.

Collaboration. A third useful practice cited by participants was the collaboration between coach and teacher. Unlike traditional professional development opportunities which involve one expert presenting to an audience for a single period of time, participants found this intervention's opportunities for collaboration and sharing ideas to be a useful practice. Previous research concluded teachers are more willing to take risks and try new strategies when they collaborate with an instructional coach to share ideas, locate resources, or problem-solve potential issues (Eisenberg & Medrich, 2013; Habegger & Hodanbosi, 2011; Putnam & Borko, 2000). Participants described multiple examples of collaboration. For example:

> Amy: Like it has been the best six weeks of the school year because I had somebody to bounce ideas off of, and then get really good ideas.
>
> Emily: I think that planning with a technology coach was the most beneficial.
>
> Melissa: There was something good in all of it, but I think honestly, the sitting down and the talking through the plans [was the most useful].
>
> Sarah: The follow-up meetings were really helpful as well…to kind of reflect and think through, but really those planning sessions were the most important piece, I think, because we were able to talk things out and try things out together, like, give me an opportunity to try it out, and then we could jump in and do it with the kids.

Participants were able to apply their learning to new instructional contexts through collaborative lesson planning. Leveraging lesson planning as an avenue for collaboration mirrored previous studies also based on McClellan's (1996) model of situated learning (Bell et al., 2013; Leaman & Flanagan, 2013). These methods of collaboration helped

facilitate the transfer of learning from coach to participant. Situated cognition theory affirms the importance of this collaborative process, particularly in the phase between lesson plan and classroom instruction. Brown et al. (1989) described the difference between a picture of a machine in a manual and the machine itself, noting each is required to fully understand the other. The same concept applies to a lesson plan and actual instruction, suggesting the work of manifesting a plan into a lesson provides a key area for learning.

When asked to reflect on their experience, participants identified characteristics and practices not found in traditional methods of professional development. While this intervention did not fully achieve the desired changes in practice, participants' responses demonstrate a situated coaching model is on the right track for an effective professional development design.

Digital learning environment indicators. Participants began this study with general understanding of the indicators in AdvancED's ELEOT describing a Digital Learning Environment. This school used this tool for classroom observations for at least two years prior to this intervention and collectively as a faculty had discussed meanings and examples of student technology usage to address each indicator. However, for at least one participant there was still a lack of clarity about how to design learning experiences to foster this concept of a digital learning environment. Sarah asked during her preinterview, "Can you show me how I could utilize technology, and it would look like what we're looking for on the ELEOT?" Participants were not alone in their lack of understanding. There is limited research using this instrument; however, previous studies using ELEOT observation data indicate averages for each indicator, between one and

four. A rating of one means the indicator was not observed during the observation, a two means the indicator was somewhat evident, a three means the indicator was evident, and a four denotes the indicator was very evident during the observation. For each of the three indicators, the average was below a 2.0, or somewhat evident, with Indicator G1 having the highest average and Indicator G3 the lowest (AdvancED, n.d.a; Szakasits, 2018). Results from this study mirrored previous findings. This intervention (a) equipped participants to plan opportunities for students to use technology for gathering, evaluating, or using information as described by Indicator G1, but it did not adequately prepare participants for (b) designing learning experiences requiring students to research, solve problems, or create as described by Indicator G2 or (c) providing students with opportunities to use technology for collaborating or communicating as described by Indicator G3.

Indicator G1. This intervention equipped participants to plan opportunities students to use technology to gather, evaluate, and use information for their learning. Two participants expressed a general comfort with this indicator. Melissa reflected in her postinterview, "Collectively…as a school G1 [is an indicator] we do pretty well at." Amy wrote in her journal, "We routinely use digital tools/technology to gather, evaluate, and/or use info (G1)" before listing a series of examples. Prior to this intervention, each participant utilized websites and digital books as ways for students to gather, evaluate, and use information. Three participants shared an example of a new practice or instructional idea stemming from this intervention that addressed this indicator.

Amy: We explored tornadoes…using [Google Expeditions].

Emily: For example, the exploration of the Cuban Missile Crisis we did in Social Studies [using an interactive website from the John F.

Kennedy Presidential Library and Museum] certainly helped my students understand the fear and relevance of that crisis in the United States.

Sarah: With students that are practicing sight words, I've recorded myself spelling and writing sight words, and plan to share them with these students to practice spelling and writing them during their 30-minute intervention block.

During this intervention, participants began to address Indicator G1 using a wider variety of tools (i.e., augmented reality, multimodal websites, and instructional videos) to gather, evaluate, and use information for learning. Student use of technology may be more prevalent and purposeful when planning these activities, but they require little change in existing classroom practices (Sandholtz & Reilly, 2004) and tend to be low-level tasks (An & Reigeluth, 2012; Barron, Kemker, Harmes, & Kalaydijan, 2003; Ertmer, 2005). While each of these examples was a modification of how content was delivered to students, how students demonstrated their learning of the information remained relatively unchanged.

Indicator G2. This intervention was less successful preparing participants to designing learning experiences requiring students to research information, solve real-world problems, or create something to demonstrate their learning. Here, the locus of control shifts from teacher to student which researchers (An & Reigeluth, 2012; Ertmer et al., 2003) affirm requires a more facilitative role for the teacher. Participants began to express more challenges in planning for these types of learning experiences. When asked which indicator they felt was most difficult to plan for, Amy, Melissa, and Emily all selected G2. Emily explained her perception why in writing, "I find G2 to be the most difficult indicator to plan for because it is not always applicable to what students are working on independently." Earlier in her preinterview, Emily was sharing about a time

students used an interactive online module and she included the phrase, "when I was able to let go and let them have the chance to interact with [the module], I saw the benefits of it." Perhaps this difficulty letting go of control and assuming a more facilitative role poses the greater challenge. Additionally, a lingering barrier of time due to an educational focus on standards and tests may influence participants' willingness to incorporate more student-centered instructional practices (An & Reigeluth, 2012). Despite expressed challenges, as a result of this intervention two participants still identified examples where students used technology for research and creativity. Melissa shared her students used an iPad application to aid them in writing their own acrostic poems. Sarah used the screen recording feature of the iPads so students could record themselves reading books fluently and listen to their own reading. She described how her approach changed through this intervention:

> [Without this intervention] I probably would have gone to just having them use the voice recorder app, record what they read, and when they listened back to it, they had to try and track and follow [along with the text] and I don't know if [only recording voice] would have been as successful because with the screen recording versus just the voice recording…it really made it effective for them to be able to watch the video, see the text, and listen to what [they read].

After this intervention, there was no change in the observed frequency of students using technology for researching, solving problems, or creating original works. This static frequency suggests while participants carried out new activities for students to meet this indicator during this intervention, challenges still exist for making sustained changes in practice.

Indicator G3. This intervention also did not adequately prepare participants for providing students with opportunities to use technology for communicating and collaborating. While previous research indicates teachers are becoming more cognizant

of possibilities for student collaboration and communication using technology (Ertmer et al., 2012; Geer et al., 2017; Hutchinson & Woodward, 2014; Pegrum et al., 2013), ELEOT data show this area continues to be observed with least frequency (AdvancED, n.d.a; Szakasits, 2018). Both Amy and Sarah cited difficulty translating this indicator into classroom practices. Even near the end of this intervention, Sarah expressed confusion about this indicator in her journal: "The area of communicating is most difficult because I'm not sure what that looks like. Are students communicating about something on the digital tool in person, or communicating through technology, or both?" This indicator also yielded the fewest examples of new student uses of technology stemming from this intervention. Only Amy shared a new practice, which involved her using Apple Classroom and an Apple TV to project students' screens to the classroom display for students to communicate how they answered a given question and compare their response to peers' responses. Six weeks of situated coaching did not adequately address participant understanding of this indicator, and subsequently, did not contribute to observable changes in student use of technology for communicating or collaborating.

Teacher-participants were able to provide multiple examples of how they met the first indicator of a Digital Learning Environment but had more questions and concerns than examples for the remaining indicators. While introducing participants to technology integration at a lower level to build confidence may eventually lead to more complex uses in instruction, there is no guarantee this progression would naturally occur (Ertmer, 2005). A more intentional focus on student-centered, collaborative practices may be required in future coaching interventions to yield observable changes in classroom practices.

Unquantified progress. While the ELEOT measures the final outcome of technology integration, quantitative scores did not fully capture participants' progress in their technology integration (Kopcha et al., 2020). Their increased understanding of the process of technology integration was reflected in their perceived value of technology and their goals for continued learning beyond this intervention. Participants' perceived value of technology refers to positive or negative contributions student use of technology makes to accomplishment of instructional goals (Inan & Lowther, 2010; Miranda & Russell, 2012; Ottenbreit-Leftwich et al., 2010; Watson, 2006; Yu, 2013). Participants (a) identified both negative and positive examples of technology's instructional value, and (b) their goals both during and after this intervention reflected a desire to continue to progress in their understanding of technology integration.

Technology's value. Teachers' perceived value of technology aligns closely with the quantity and quality of their technology integration (Vongkulluksn et al., 2017; Wozney et al., 2006). Previous research demonstrated teachers who did not see positive instructional value in technology were less likely to use technology for student learning activities or extended projects (Radecki, 2009) and were more apprehensive about technology (Durff, 2017). Conversely, teachers who see positive instructional value are more apt to experiment with technology's role in both content and pedagogy (Hughes, 2005; Sandholtz & Reilly, 2004; Sandholtz et al., 1997). In this study, though two participants identified negative aspects, participants overwhelmingly perceived technology to have positive instructional value.

Only two participants described negative value of student use of technology in the classroom. Amy noted technology sometimes made tasks more difficult, resulting in

more time wasted than had technology not been used. She gave an example in her preinterview of using an interactive science platform and after overcoming difficulties logging in, she and the students both weren't sure what to do to make the module work. Eventually she realized instructional time was slipping away, she resorted to a familiar hands-on activity that did not require technology. Emily cited in her reflection journal students' increased distractibility when using technology, but she did not provide a specific example. This concern mirrors previous research finding students can be distracted both by multitasking, features and tools on their own device, or classmates' digital activities (Garwood, 2013; Sana et al., 2013; Zucker, Moody, & McKenna, 2009). For two participants who initially described instructional time constraints, complexity and distractibility impede desired efficiency. While these two drawbacks were noted, they did not outweigh positive values for any of the participants.

Every participant contributed multiple aspects of technology's positive instructional value. Participants described how student use of technology allows students to control their own learning, aligning with findings of increased student independence from previous research (Ditzler et al., 2016; Milman et al., 2014; Ruggiero & Mong, 2015). For example:

Amy:	They're gaining knowledge from [technology], so that they're not always getting everything from me…It opens an endless flow of information when they are researching.
Emily:	I believe that my incorporation of technology allows students to control their own learning.
Melissa:	Having more than one app that they could use for one particular task gives them options.

One participant also affirmed previous research (Beeson, 2013) when she shared the value of technology in developing students' conceptual understanding and helping them gain deeper understanding of abstract concepts. Emily said, "Students gain a deeper understanding through [Explore Learning's Gizmos] because it supplies them with the how and why of different math and science lessons." All four participants described findings similar to Milman and colleagues (2014) when discussing how students used technology to collaborate with one another and to create products to communicate their learning to others. For example:

> Amy: The technology used in math definitely engages them, they are seeking answers [and] showing their work with others.
>
> Emily: Students were willing to share more of their thinking and prior knowledge because they were interested in the lesson.
>
> Sarah: Technology has impacted my students by giving them opportunities to create and problem solve in new ways through using their iPad, and not just paper/pencil or researching in books…I now have students doing more with creating and solving math problems in their whiteboard app and collaborating when solving.
>
> Melissa: [New math apps] enabled my students to use [their] knowledge to create something original with a peer/individually.

Professional development is more effective when it aligns with participants' values (Ottenbreit et al., 2010; Stanhope & Corn, 2014). In this intervention, coaching helped shape these values by introducing strong examples of technology integration through modeling and lesson planning. The positive values shared by participants reflect student-centered instructional practices not yet consistently observed. However, researchers indicate the higher teachers' value beliefs, the more student-centered their instruction gradually becomes (Ertmer et al., 2012; Hixon & Buckenmeyer, 2007; Hsu, 2016). As a

result of this intervention, participants' perceived value of technology increased and began to more closely resemble indicators of the digital learning environment in the ELEOT. Participants are more likely to continue integrating technology when doing so reinforces this perceived value (Kopcha et al., 2020).

Participant goals. Participants also shared personal goals demonstrating a desire to continue growing in their understanding of the process of technology integration. Previous research suggests the importance of allowing teachers to set their own goals in instructional coaching relationships as an important motivation for new learning (Beyerbach et al., 2001; Hilgard & Bower, 1966; Killion, 2012; Knight, 2007; Sugar, 2005). Ertmer (2005) suggests coaches begin with technology tools that support teachers' current practices before scaffolding them to reach higher instructional goals. Participants in this study expressed self-selected goals prior to this intervention.

Teacher-participants were asked in preinterviews what their goals were during the coaching intervention. Participants most often spoke generally of wanting to integrate technology more into teaching and learning. They said:

Amy: I want to learn more ways to use the technology in the classroom.

Emily: I hope to be able to use [technology] in a very authentic, genuine way that will help [my students].

Melissa: I want to learn and expose (and ultimately teach) the students more through technology than I had before.

Sarah: I'd like to learn ways I can incorporate technology and utilize the iPad in all subject areas. I want students to be able to use their iPad as a tool for learning.

Additionally, two participants referenced goals they had for personal growth. Emily wanted to grow in her confidence with technology and Amy wanted to become more

familiar with specific hardware and software. Sarah expressed the most specific instructional goals, wanting students to "actively [use] technology to…problem-solve" as well as use technology to "create things, research, collaborate, and problem-solve in all subject areas." Beyerbach and colleagues (2001) stressed the importance of participants determined their own goals. Rather than a directive coaching relationship, pushing participants toward predetermined ends, this intervention design utilized responsive coaching to address specific needs expressed by participants (Knight, 2007). Self-selected goals naturally align with participants' existing beliefs (Gordon, 2004), and participants are more motivated when they take an active role in determining goals (Hilgard & Bower, 1966). This motivation to achieve stated goals is critical because participants' success and failure at reaching the goal determines how they approach future goals (Hilgard & Bower, 1966). Quantitative ELEOT data shared previously in "Digital Learning Environment Indicators" show participants made progress toward a goal of increased technology usage, particularly for Indicator G1 in which students use technology to gather, evaluate, and use information for learning. Qualitative data discussed earlier in "Barriers Overcome" reveal participants also progressed toward goals of increased confidence and proficiency with technology. Sarah's instructional goals were partially addressed when her students created multimedia recordings of their reading to monitor reading fluency. In her postinterview, Sarah shared a desire to take additional graduate courses to continue her progress. Participants' wide range of stated initial goals demonstrate a need for revision to the interview question to target their specific instructional goals, discussed later as an implication for future research.

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND LIMITATIONS

This chapter shows how findings from this study relate to literature on situated coaching for professional development, technology integration practices, and teachers' perceptions of barriers to technology integration. The purpose of this research was to assess participants' experience of a situated coaching model for technology professional development, evaluate the impact of a situated coaching model on digital learning environment observation scores for participating elementary classroom teachers at a County School District elementary school, and evaluate this model's impact on participants' perceptions of issues related to integration of student use of digital tools into their classrooms. Six primary themes emerged from the data analysis (see Table 4.10). Participants' thoughts on technology integration, digital learning environments, coaching, and barriers to integration were captured before and after this intervention. Data from both quantitative (i.e., ELEOT observation ratings) and qualitative methods (i.e., preinterviews, postinterviews, and participant reflection journals) were collected and subsequently analyzed. The (a) discussion, (b) implications, and (c) limitations of this research are examined in the following sections.

Discussion

A full understanding of results from this study requires interpreting them through existing research on effective professional development and technology integration. To answer the research questions, the data were combined and viewed through an

understanding that the goals of professional development are changed classroom practice and participant understanding. Literature on adult learning theory and cognitive apprenticeship also contributed to understanding conditions that facilitate a transfer of learning from coach to participant. The discussion is organized by the three research questions.

Research Question 1: How do participants experience a situated coaching model for technology professional development?

This research question stemmed from wanting to understand participants' responses to this extended form of professional development. Previous professional development offerings consisted of isolated after-school or summer sessions lasting no more than two hours. To design this coaching model, I referenced existing research identifying characteristics of effective professional development, including a sustained length of time, active engagement, collaboration, coherence, and a contextual application (Garet et al., 2001; Gaytan & McEwen, 2010; Hunzicker, 2011; Johnson et al., 2017; Penuel et al., 2007; Pettet, 2013). Participants expressed this was an effective professional development experience, particularly due to the sustained duration and the embedded nature of coaching within their classrooms. All four participants shared they would have preferred the coaching partnership continue after the conclusion of the six weeks of intervention. While typical district technology professional development offerings used more of a presentation or lecture format, participants cited this model's inclusion of modelling, co-teaching, and collaboration as practices that contributed to their growth as practitioners. Answering research question one, participants positively experienced a situated coaching model of professional development due to (a) specific

characteristics not present in other professional development experiences and (b) practices that fostered cognitive apprenticeship, resulting in (c) changed instructional practices and thinking about technology integration.

Specific characteristics. Prior professional development opportunities for teachers did not incorporate criteria identified in research as critical for effective professional growth. These prior opportunities followed a paradigm of training wherein professional learning occurred outside of the classroom, at a scheduled time, and was led by an expert presenting information to groups of teachers (Helm, 2007; Little, 1993; Wesley & Baysse, 2006). A majority of professional development came through afternoon training sessions, summer institutes, workshops, or school or district in-service sessions, mirroring traditional methods identified in previous research (Desimone et al., 2002; Garet et al., 2001; Helm, 2007; Little, 1993). As a technology coach, I used these methods to train teachers in specific techniques (i.e., digital storytelling, digital citizenship, infographics) or materials (i.e., Google Classroom, Chromebooks). Despite research showing these formats have little impact on teacher learning and practice (Desimone et al., 2002; Garet et al., 2001; Parise & Spillane, 2010), these formats were used for standardization in communication, fulfilling mandatory professional development requirements, and their limited cost (Diaz-Maggioli, 2004; Oliver-Brooks, 2013).

Garet et al. (2001) found more important than the format of learning, however, was inclusion of effective characteristics identified in professional development research. Effective characteristics include a sustained, intensive duration (Adelman et al., 2002; Garet et al., 2001; Porter et al., 2000), active engagement within participants' classroom

contexts (Parise & Spillane, 2010), collaboration with peers (Parise & Spillane, 2010; Showers & Joyce, 1996), and coherence to school or district goals (Garet et al., 2001; Penuel et al., 2007). When asked, participants identified multiple characteristics unique to this model they felt were beneficial to their learning including its sustained duration, responsiveness to individual needs, and opportunities for active learning. These characteristics were identified primarily in participants' answers to a postinterview question and from reflection journal entries. Other characteristics that were purposefully integrated, but not specifically mentioned by participants, included coherence through a content focus and postintervention evaluation.

Duration. This study affirms the findings of both Garet et al. (2001) and Hunzicker (2011), who found effective professional development takes place over an extended time span with increased contact hours. Increased contact hours allow for participants to engage in deeper learning conversations and give time for participants to apply and receive feedback on new learning (Garet et al., 2001). Desimone and Pak (2017) point to coaching as a means to achieve this sustained learning. To allow for sustained learning, this intervention was designed to last six weeks with 21 contact hours, a characteristic that participants not only identified as impactful, but expressed a desire to magnify. Amy commented, "When I realized our six weeks were up, I was like, oh, I want to do six more weeks." Garet et al. (2001) found reform activities, such as coaching, last an average of 35 hours and can extend for nine months or more. This intervention lasted below the average of contact hours and was a fraction of that duration. Amy's request for six more weeks indicates the duration of this intervention needed to be

extended to satisfy her desire for professional learning, which will be discussed further as an implication for future research.

Responsiveness. As a coach situated in the school, I used my responsiveness to participants' needs and goals to form working partnerships, supporting previous research on how to build connections through responsiveness to individuals (Dozier, 2006). Responsive professional development leverages individual participants' interests, needs, and skill sets to encourage willing participation in the learning (O'Hara et al., 2013). Melissa recognized this focus on her as an individual, writing in her journal, "Having a technology coach meet with me to discuss my needs and questions has been amazing." Amy described one interaction at a point of need in her postinterview, "When I had some questions about…how do I get [form responses] to erase, then we did that," and then went on to say, "To have someone sitting right there and say, 'Try [highlighting and clearing cells] and let's see if it works…was very helpful." At least one participant became more willing to engage in the learning once she saw it was going to meet her individual needs. Amy shared, "I thought [participating in this intervention] was going to be a burden and whole lot more work…I didn't realize it was actually going to teach me how to do things that were going to lessen my work and make me feel more comfortable." This aligns with research findings demonstrating when individual needs are addressed, the likelihood of technology integration increases (Ertmer & Ottenbreit-Leftwich, 2010; Solomon, 2005). Situated instructional coaching is one of the few professional development models allowing for this level of personalization (Czajka & McConnell, 2016).

Active learning. Active learning requires participants to actively take part in analyzing teaching and learning (Garet et al., 2001). This can take multiple forms, including observing expert practitioners, being observed by an expert and receiving feedback, engaging in planning for future teaching and learning, and producing written work in response to implementation of new learning (Garet et al., 2001). This intervention design included all four aspects at various times during coaching partnerships. Amy addressed how she replicated new practices after she observed modeled math lessons:

> I felt like getting to watch you model the two weeks that you did with the [math application with fraction manipulatives and number lines] and the way you were able to put [students' work] up [on the classroom display] and then guide them through what they were doing, I kind of copied that after your two weeks of being done in math.

Additionally, though not specifically addressed by participants, as the coach I observed teachers conducting lessons and provided feedback. Sarah talked about these coaching conversations in her postinterview, "The follow-up meetings were really helpful as well…to kind of reflect and think through." Sarah continues on to address the planning aspect of active learning, "But really, those planning sessions were the most important piece, I think, because we were able to talk things out and try things out together." She recognized the active role she played in those conversations, as opposed to traditional professional development where participants merely receive information from a presenting expert. Emily identified written reflection, another component of active learning, as most beneficial, "When I was able to reflect on my practice in a written way…that was beneficial to me because this is a practice where you have to constantly reflect in order to improve." Emily's quote supports research linking active learning to

improved outcomes in both pedagogical practice and teacher attitudes (Borko, 2004; Darling-Hammond, 1997; Desimone et al., 2002; Johnson et al., 2014; Johnson & Fargo, 2010).

Coherence through content focus. Professional development activities of longer duration help better demonstrate to participants alignment, or coherence, between new learning and existing state standards, local frameworks, participant goals, and participant beliefs (Garet et al., 2001; Penuel et al., 2007). When professional development is integrated into participants' daily school environment, researchers have found a greater fidelity with implementation of new learning (Penuel et al., 2007). There are mixed findings on the effects of coherence. Garet and colleagues (2001) found positive effects of coherence on participants' knowledge and skill, as well as changes in teaching practice. Conversely, Desimone and colleagues (2002) did not find a strong effect of coherence on application of new learning. Regardless, coaches serve a dual role in coherence of professional development to existing beliefs and goals. In one aspect, coaches work to help teachers align new learning with existing beliefs and goals, serving to help teachers connect professional development expectations and daily instructional practice (Desimone & Pak, 2017). If coaches only aligned new learning with existing frameworks, however, technology integration would likely remain confined to teachers' current low-level uses (Ertmer, 2005). Coaches must also gradually encourage replacing or modifying participants' existing beliefs to move participants to higher level uses of technology (Ertmer, 2005). In this intervention, coherence was fostered through use of the ELEOT indicators of a digital learning environment, as the ELEOT was the observation tool utilized by the school and district. Coherence was also addressed

through asking participants about their goals prior to beginning the intervention, and then designing learning to help them achieve those goals. As one example, Emily began with a goal to not be as hesitant with technology. During the coaching intervention, I encouraged her to utilize student experts in the room and let them help each other, removing the burden from Emily of being the only source of assistance in the room. Finally, coherence was fostered through a content focus in coaching conversations. Throughout the six weeks, there was always a content area of focus that guided our lesson planning and classroom assistance. We began with two weeks focused on math, then two weeks focused on language arts, and the last two weeks focused on science and social studies. Instead of generalized professional development, we were able to directly address current units, lessons, and state standards. While participants did not specifically reference coherence in their postinterviews or reflection journals, research demonstrates it a key component to improving teacher quality (Johnson et al., 2017).

Evaluation. In a review of research on technology professional development, Gaytan and McEwen (2010) found over half of the studies relied on self-reported information from participants through questionnaires, interviews, or both. None of the studies in their review measured student learning and most failed to evaluate beyond participants' perceptions of logistics or their own interpretation of their learning. Judson (2006) expressed concern that self-reported measures often provide an inaccurate picture of how participant understanding translates to actual classroom practice. Judson instead posited classroom observations as a more precise measure of professional development's effectiveness. The primary goal of professional development is changed practice and improved student learning (Gaytan & McEwen, 2010) and merely measuring

participants' reactions is not an adequate way to assess this goal (Lawless & Pellegrino, 2007). Actual observation can provide a more complete view of classroom practices and increase the validity of a research study (Kawulich, 2005). This study incorporated both self-reported measures (e.g., interviews and reflection journals) and observation to obtain a more complete picture of the model's effectiveness for professional development. Kreider and Bouffard (2006) cautioned time is needed before collecting evaluation data in order for participants to implement changes inspired by professional development. Thus, postintervention observations were conducted beginning two weeks after the end of the coaching intervention. In addition to coherence described earlier, the ELEOT was specifically selected because it measures student behaviors related to technology integration. While this instrument served to capture the ultimate goal of professional development, changed classroom practice, it only measured the final destination and not the journey of participant growth (Kopcha et al., 2020). This measurement limitation is further described in the following section.

Cognitive apprenticeship. A primary goal of professional development is to transfer learning from expert to participant. Transfer occurs when an expert teaches knowledge and skills to a novice to the degree that the novice can employ the knowledge and skills independently (Collins et al., 1989). To achieve this transfer, this situated coaching model design was informed by adult learning theory (Knowles, 1973), situated cognition theory (Brown et al., 1989), and the cognitive apprenticeship model (Collins et al., 1989). Professional development opportunities offered in this district in the past typically did not move beyond modeling, neglecting additional phases of cognitive

apprenticeship theory, such as coaching, scaffolding, and application, identified by Collins and his colleagues as critical for the transfer of learning.

Participants described this model as an effective design for transferring learning from coach to participant, particularly through the incorporation of modeling, co-teaching, and collaboration. Participants referenced the transfer of learning in all three qualitative data sources. For example, in her postinterview Amy noted, "I felt like getting to watch you model the two weeks…I kind of copied that after your two weeks of being done in math." Sarah reflected in her journal, "My biggest celebration was planning a math activity utilizing technology with the technology coach, and then adding to it on my own to extend students' learning and practice of math skills." Emily described in her preinterview how she felt co-teaching would aid her learning. She said, "I'm a big fan of [co-teaching] because you can just bounce off of each other and then eventually scaffold into, okay, I've done my part, so let me hand this over to you and see what you can do with it, and then I apply it and implement it myself." Participants' responses indicate a situated coaching model was an effective method for transferring technology integration understanding and skills.

This study supports Knowles' (1973) premises of adult learning theory, specifically that adults need to learn experientially. Adults define themselves by their experiences (Knowles, 1973) and base their learning activities in past experience, positive or negative (Knowles, 1980). Previous district professional development workshops explained technology integration in theoretical terms and provided some concrete examples, but attendees were recipients of information without experiencing the process firsthand. In this intervention, in order to provide participants with experiences

that would move them toward integrating opportunities for student use of technology in a planned and purposeful manner, coaching conversations focused on the process of integrating technology, not just on tools and platforms. One example of this process focus is through the introduction of the Triple E Framework (Kolb, 2017), which uses a series of guiding questions and principles to shape participants' thoughts when planning technology integration. Sarah wrote in her journal, "Three things I think made a big impact when thinking about and planning for technology: the [Triple] E's of technology, guiding questions we discussed, and [a search technique for finding lesson ideas]. I am using these as a guide now when planning technology incorporated lessons." Carter (1990) found as teachers gain additional experience, they are better able to recognize how knowledge influences practice. Sarah took new professional knowledge and, through experiential learning of planning alongside a coach, was able to influence her own lesson planning practice. Adult learning theory indicates participants' opportunity to engage in this and similar experiences during the intervention resulted in a greater transfer of learning than the isolated professional trainings previously offered.

This study also aligns with situated cognition theory (Brown et al., 1989), which describes the importance of learning new information in the context in which it will be used. Traditional training provided by district technology coaches required teachers to go to a centralized location, usually a computer lab or board room, which impeded participants' ability to place new learning in a classroom context. Brown et al. (1989) suggested that learning is more associated with the context in which it is learned, not the desired context of application. This coaching model situated new learning within the participant's own classroom and instructional plans to enhance the transferability of new

skills and understanding. Participants were able to learn new skills and processes as they were delivering instruction or designing lessons with existing classroom resources. Melissa recognized the impact of remaining on site, sharing in her postinterview that "I thought it was very effective having you [here] and…your willingness to get in the trench with us." Amy also noted in her postinterview the positive effect stemming from "someone sitting right there and say[ing], 'Try this and see if it works'…Those [digital tools] are all things that I'm using daily now that I wasn't using six weeks ago." Amy could more readily transfer new learning because we used her iPad and her students' iPads in her classroom using her display panel and the existing classroom configuration to teach her grade level standards. Amy's ability to quickly incorporate new learning supported Luft and colleagues (2003), who found teachers who received professional development within the specific context of their content area, or situated cognition, were more frequent integrators than teachers receiving general professional development.

This study's successes support a professional development design using three steps of Collins et al.'s (1989) cognitive apprenticeship theory (i.e., modeling, coaching, and fading) in order to increase learning transfer. Sarah referenced the importance of modeling in her postinterview. She explained, "I'm a visual learner and so, like, I needed to see how somebody might roll out a new app or a new site." Modeling allowed participants to see me, as the coach, use strategies and language when working with students and technology that they could then replicate in future lessons. One example Sarah highlighted was how when I introduced students to a new app, I allowed them five minutes to explore buttons and menus, so they were not distracted by them later when receiving directions. She said in her postinterview that this was an idea she would

replicate the next time she introduced something new. Coaching provided an opportunity to give feedback as participants tried out new skills with expert support. Amy shared in her postinterview, "I felt like when we talked about [technology], it helped me know what I needed to learn better to do or that I was on the right track." As carried out, this coaching model did not adequately include the fading step to prepare participants for implementing new learning independently. Participants expressed a heightened level of confidence in their use of technology as evidenced by comments such as "I just think [this coaching intervention]'s built my confidence" (Amy), "feeling okay to fail in front of my kids" (Sarah), and "I've gotten more comfortable with [technology]" (Emily). Their desire to lengthen the intervention, however, indicated they did not yet feel prepared to continue without direct coaching support. This will be discussed more in implications for future research.

Professional growth and learning. Stanhope and Corn (2014) asserted changes to practice were a necessary part of integrating technology. Lawless and Pellegrino (2007) suggest, "The most important factor a professional development activity can have on a teacher is that of pedagogical practice change" (p. 597). How those changes occur in teaching practice is linked to the design of professional development opportunities (Borko, 2004). Multiple researchers (Cole et al., 2002; Kariuki et al., 2001; Orrill, 2001; Stanhope & Corn, 2014) identified the presence of a coach as a supportive factor in teachers making needed changes. Coaches also aid teachers in becoming reflective practitioners, contributed to changes in thinking (Heineke, 2013).

Participants were changed as professionals as a result of their involvement in this study. This situated coaching model yielded changes in practice (i.e., planning,

instruction, and classroom management) and thinking (i.e., perspective on technology and definition of integration), indicating professional growth and learning. Again, in journal entries and postinterviews, participants detailed examples of these changes. Sarah pinpointed her "biggest area of growth is better understanding the technology expectations of the ELEOT and being able to plan lessons to meet those expectations." Melissa said, "I think more outside of the box when you introduced me to…bringing other people in [to the classroom through technology.]" Emily shared that responding in the reflection journal "gave me a different perspective of myself as a teacher." Participants experienced this model as a transformative method of professional development, moving them along a continuum of technology integration expertise in just six weeks of coaching.

This study supports the work of Parise and Spillane (2010) who found professional development situated in the context of participants' jobs was associated with changes in instructional practice. These researchers also identified collaborative discussion as the greatest predictor of teacher change. Emily, Sarah, and Melissa all referenced the coaching conversations during lesson planning as particularly impactful in growing their thinking about lesson design and instructional delivery. For example, Sarah said in her postinterview, "Those planning sessions were the most important piece, I think, because we were able to talk things out and try things out together." Emily shared in her postinterview, "I think that planning with a technology coach was the most beneficial." Melissa said, "Honestly, the sitting down and talking through the plans [was the most beneficial]." Changed instructional practices observed included developing activities with connections to the world outside the classroom. Sarah and Melissa both

used a digital image of a vending machine, differentiated with different prices for different student groups, to encourage writing of real-world math problems using money. Participants used technology to gain information through new avenues, such as augmented reality to observe severe weather (Amy) and an interactive online library exhibit on the Cuban Missile Crisis (Emily). Sarah changed how she had students self-monitor their reading fluency by using the native iPad screen recorder and camera. All of these changes took place in conjunction with lessons participants were actively planning or as a result of a need observed due to spending time in participants' classrooms, such as seeing Amy spending a lot of class time checking her students' understanding of divisibility rules each day and helping develop a Google Form to collect that data daily instead. Because this professional development model was situated in participant classrooms, timely conversation and instructional suggestions could quickly translate into shifts in practice (Desimone et al., 2001; Parise & Spillane, 2010; Porter et al., 2000).

Participants' descriptions of a change in perspective after reflection aligns with previous research by King (2002) and Hughes (2005) who found helping teachers recognize their current understanding and then providing alternatives can lead to perspective shifts and professional growth. By strategically posing alternatives, teachers "question or reflect on their practice and potentially change their beliefs and practice" (Hughes, 2005, p. 297). King identified shifts in perspective, such as teacher- to student-centered learning, as a result of scenarios designed to challenge teachers' current beliefs and lead them to change their actions in response. In her postinterview Emily said, "[I] have these blinders on that I'm only going to reflect on the things that I'm aware of and I'm knowledgeable about. You don't think about other people's perspective or a

technology perspective." She goes on to describe how the reflection prompts caused her to remove the blinders and see integration from a different perspective. Instead of thinking about integration with the technology as a starting point, a perspective shift led to thinking about integration with student learning as a starting point. Sarah described this change in her postinterview, "before I was thinking too complicated, almost like I needed the kids to design a website for it to really be a good technology lesson, and it's really just smaller than that. I mean, it's just sharing the iPad, putting it in between them." She goes on to she's "just come to understand what [integration] is so I'm planning and preparing for it." Her point was a new understanding that integration is in how technology helps students engage in learning, not necessarily in what students are doing on the technology. Reflections and perspective shifts such as this one take time and personal coaching attention not typically afforded by traditional professional development design (Czajka & McConnell, 2016).

Research Question 2: How does a situated coaching model affect participants' digital learning environment observation scores?

This research question stemmed from wanting to understand how professional learning about technology integration translated into actual classroom practice. Many previous studies examined technology integration practices through self-reported survey or interview data (Adams, 2015; Bebell et al., 2004; Carver, 2016; Geer et al., 2017; Miranda & Russell, 2012; Mueller et al., 2008; Pittman & Gaines, 2015; Ruggiero & Mong, 2015; Vongkulluksn et al., 2017). Similarly, effectiveness of professional development design was often measured through self-reported data (Adams, 2015; Brenner & Brill, 2016; Carpenter & Linton, 2018; Cifuentes et al., 2011; Johnson et al.,

2017; Makki et al., 2018; Penuel et al., 2007). However, Judson (2006) notes, "Versus self-reported practices, direct observations…are a more precise, albeit protracted, measurement." This study was modeled after other research which used a combination of self-reported data and classroom observations to gain a more holistic understanding of classroom practices (Garwood, 2013; Hsu, 2016; McKnight et al., 2016; O'Hara et al., 2013; Swan & Jennings, 2002).

The ELEOT provides observational indicators for seven aspects of an effective learning environment. The tool breaks down Environment G: Digital Learning into three indicators, each of which look at student use of technology. Observers analyze Indicator G1 by looking for learners to use digital tools/technology to gather, evaluate, and/or use information for learning. This may look like students accessing search engines to find resources or information on topics of interest (AdvancED, 2017b). Observers analyze Indicator G2 by looking for learners to use digital tools/technology to conduct research, solve problems, and/or create original works for learning. This may include designing graphics, working on projects, finding resources for research to help solve real-world problems (AdvancED, 2017b). Observers analyze Indicator G3 by looking for learners to use digital tools/technology to communicate and/or work collaboratively for learning. This may include using blogs or social media, working with others on a project or activity incorporating technology, or providing feedback to peers online (AdvancED, 2017b). Observers rate each indicator on a scale of 1 to 4. A rating of one means the indicator was not observed. A rating of two means the indicator was somewhat evident, either clearly not part of a regular routine, superficially applied, or observed with limited frequency or students (AdvancED, 2017a). A rating of three means the indicator was evident, a

generally understood practice, and moderately observed in complexity, frequency, and student application (AdvancED, 2017a). Finally, a rating of four means the indicator was very evident, a regular part of the classroom routine and environment, observed with deep complexity, high frequency, and nearly unanimous student application (AdvancED, 2017a).

For this study, ratings of two through four were grouped together under a classification of observed. A rating of one remained classified as unobserved. Frequencies of observation were compared before and after the intervention to assess the impact of this model on classroom practices. Quantitative observation data were supplemented with qualitative participant data from interview statements and journal reflections. Answering research question two, a situated coaching model (a) contributed to a greater frequency of observation for Indicator G1, (b) did not alter the frequency of observation for Indicator G2, but led participants to implement new activities, and (c) did not alter the frequency of observation for Indicator G3 while yielding few examples of new practices.

Indicator G1. Observing students using technology for gathering, evaluating, and using information for learning resulted in the most noted changes in practice. After the intervention there was a greater frequency of observation postintervention (preintervention $n = 6$ of 12; postintervention $n = 8$ of 11), though not a significant difference ($\chi^2 = 1.245$, $p = .265$). Melissa and Amy both spoke to a comfort and familiarity with this indicator. In her postinterview, Melissa said, “Collectively…as a school, G1 [is an indicator] we do pretty well at.” Amy reflected in her journal, “We routinely use digital tools/technology to gather, evaluate, and/or use info.” Participants

used a wider variety of tools to address this indicator during this intervention as well, moving beyond just digital books and websites to include Google Expeditions for virtual and augmented reality experiences, interactive websites, audio, and video files.

This study mirrors other research using the ELEOT which also found Indicator G1 to be the most evident in classroom observations (AdvancED, n.d.; Szakasits, 2018). The frequency of observation in this study, 73% (8 of 11 observations), was almost twice as much as the 38% frequency in Szakasits' (2018) study.

Participants moved from an entry stage of technology integration, through adoption, and into adaptation (Sandholtz & Reilly, 2004). Participants were no longer beset by technical issues but used technology in ways that required little altering of existing instructional practices beyond forms of content delivery. Nevertheless, data related to this indicator demonstrate participants progressed in their understanding and application of technology integration.

Indicator G2. The frequency of observing students using technology for researching information, solving real-world problems, or creating something to demonstrate their learning did not increase after six weeks of this model. Comparing frequencies of observation preintervention (n = 3 of 12) and postintervention (n = 3 of 11) did not yield a significant difference ($\chi^2 = .015$, $p = .901$). While working with a coach, participants incorporated new strategies for students to create original works. Melissa's students used an iPad application to create acrostic poems. In her postinterview, Sarah described her students using the screen recording feature of the iPad to create videos of a digital book as they recorded themselves reading the text aloud. Prior to this intervention, Sarah used the voice recording feature to just capture students'

voices. She highlighted the difference by saying, “When they listened back to [their voice recording], they had to try and track and follow [along with the text]…[the screen recording] made it effective for them to be able to watch the video, see the text, and listen to what [they read].” Sarah’s example illustrates how more purposeful uses of technology may replace existing uses, making richer examples of integration despite an unchanged frequency of observation.

Results for this indicator align with AdvancED’s research (n.d.) which found this to be the least frequently observed indicator. Conversely, Szakasits (2018) found a higher frequency of observation for Indicator 2 than Indicator 3. This difference may be due to varying sample sizes and grade levels involved. This study’s low frequency may have been partly due to a continued perception that Indicator 2 is only applicable at certain points in an instructional sequence. Emily explained in her journal, “I find G2 to be the most difficult indicator to plan for because it is not always applicable to what students are working on independently.” Despite this perception, the frequency of observation in this study, 27% (3 of 11 observations), was almost equal to the 29.41% frequency in Szakasits’ (2018) study.

Student behaviors in Indicator 2 can require more instructional time to effectively implement than other digital learning behaviors. There is more information to sift through when researching and solving problems. Creating original works may require learning both a new process and reconceptualizing a product. Participants already felt pressed for time prior to this intervention. Six weeks of situated coaching did not alleviate that pressure. These results support An and Reigeluth’s (2012) assertion that even when equipped with knowledge, skills, attitudes, and tools, teachers who feel pressed for

instructional time will not shift to the student-centered practices observers look for when assessing this indicator.

Indicator G3. The frequency of observing students using technology for communicating and collaborating did not increase after six weeks of this model. Comparing frequencies preintervention (n = 6 of 12) and postintervention (n = 6 of 11) did not yield a significant difference ($\chi^2 = .048$, $p = .827$). This static frequency is likely explained from continued confusion about this indicator. Amy and Sarah both expressed difficulties designing student learning experiences aligning with this indicator. Sarah wrote in her journal toward the end of the intervention, "The area of communicating is most difficult because I'm not sure what that looks like. Are students communicating about something on the digital tool in person, or communicating through technology, or both?" Participants' reflection journals and postinterviews only revealed one new practice as a result of this intervention. Amy was able to use Apple Classroom and Apple TV to project students' work on the display panel for peer discussion and feedback.

Results for this indicator align with AdvancED's research (n.d.) that found this to be observed more frequently than Indicator 2, but the second most infrequently observed indicator of the instrument. This study reported a higher frequency of observation than Szakasits (2018). Whereas in Szakasits' research, this indicator was only observed in 16.18% of observations, this study returned a 55% frequency (6 of 11 observations). This particular indicator was traditionally low for this school and an emphasis on student collaboration has prompted a focus on including opportunities both with and without technology. Perhaps the frequency of observation did not change significantly because it

was already much more frequently observed before the intervention (50%; 6 of 12 observations) than would be expected based on these other studies.

Findings for this indicator do not align with existing research on student use of technology for communication and collaboration. A wide availability of digital tools for communication and collaboration has led teachers to incorporate more opportunities for students (Ertmer et al., 2012), yet no such tools were referenced in reflection journals or interviews. Geer et al. (2017) reported student collaboration to be one of the most frequent pedagogical changes made when students gained access to iPads. It should be noted, however, that in Geer et al.'s study, research took place shortly after iPads were introduced into participating schools. This County School District school had a 1:1 program for nearly four full years prior to this research, so some of the more immediate changes to pedagogy with the introduction of personal technology would not reflect in this study's data. Regardless, this situated coaching model did not yield the expected improvements for this indicator.

Research Question 3: How does a situated coaching model impact participants' perception of barriers to implementing a digital learning environment?

This research question stemmed from wanting to understand if a situated coaching model was an effective method of removing barriers teachers face when integrating technology. The concept of barriers to classroom technology usage dates back at least 25 years (Brickner, 1995). Ertmer (1999) moved beyond simple usage and began to examine barriers to integration. Despite districts' concentrated efforts at removing identified barriers through additional money and professional development, barriers to integration continue to appear in research (An & Reigeluth, 2012; Burke, 2014; Carver, 2016; Durff,

2017; Hsu, 2016; Laferrière et al., 2013; Makki et al., 2018; Vongkulluksn et al., 2017; Walsh & Farren, 2018). This question investigated what role, if any, a coach situated within the school could help overcome perceived barriers. During their preinterview, participants were asked what barriers they anticipated encountering while integrating technology. Participants described both first-order barriers (e.g., lack of time, lack of support) and second-order barriers (e.g., past negative experiences, a lack of understanding of technology integration and the ELEOT, and a lack of self-confidence). Through working with participants in a coaching role, I tried to address these barriers through sharing resources intended to help develop an understanding of integration principles and lesson design, highlighting ways student use of technology could streamline current classroom practices, and by making every effort to provide timely support when questions and needs arose. Answering question three, this situated coaching model (a) contributed to participants overcoming some barriers, and (b) did not affect participants' perception of time as a barrier while revealing additional perceived barriers, all of which lingered after the intervention.

Barriers overcome. Participants initially described a lack of support and a lack of self-confidence as barriers to integration. Previous studies indicate a lack of support can encompass multiple facets, including a lack of technical support, a lack of leadership support, and a lack of institutional support (Cifuentes et al., 2011; Czajka & McConnell, 2016; Ertmer, 1999; Hew & Brush, 2007; Hsu, 2016). A lack of confidence can affect both teachers' decisions and beliefs regarding technology integration (Hur et al., 2016; Inan & Lowther, 2010; Miranda & Russell, 2012).

Lack of support. When asked in preinterviews about their use of district technology coaches prior to this intervention, participants were unable to articulate their role and described limited engagement. Sarah said, "I guess I just hadn't really been sure how else to utilize them [beyond troubleshooting] and what role they maybe play in planning teaching." Amy responded with, "I don't even know who they are." Emily replied, "I honestly have not reached out to the two. Actually, I'm not aware of who the [newest technology coach] is." This disconnect between district technology integration support and participants inhibited their professional growth. Previous researchers asserted teachers need support to feel comfortable with technology and improve integration efforts (Durff, 2017; Ruggiero & Mong, 2015). During the intervention, two participants shared in their reflection journals how having a coach situated in their school, responsive to their needs, provided a sufficient level of support to overcome this barrier. Melissa described how the ability to meet regularly helped address her needs and answer her questions. Amy, in particular, referenced how knowing she would have timely access to support decreased her level of frustration. However, Hur and colleagues (2016) identified that increased support alone did not influence integration, but instead gave teachers greater self-confidence in their skills.

Confidence. This study affirms the work of Swan and Jennings (2002) in which they found situated professional development contributed to greater teacher confidence in using technology. Through a positive, encouraging relationship, working with a coach can increase a teacher's confidence in integrating technology (Sugar, 2005). Past research (e.g., Ertmer & Ottenbreit-Leftwich, 2010; Gulbahar & Guven, 2008; Lawless & Pellegrino, 2007) found teachers' self-confidence increased when teachers took an active

role in learning and experienced success with technology integration activities. Three participants expressed feeling more confident and less fearful about technology after this intervention. Amy said in her postinterview, "And now I'm not as scared…[this intervention has] helped, made me more confident. It's made me feel like even if I try [something with technology] and fail it, I at least tried it, and I have a better understanding of how to do it." Emily shared in her postinterview, "I've gotten more comfortable with [technology] so when there's an issue of any kind, or a kid doesn't understand a certain aspect of it, I feel more comfortable assisting them." As Amy referred to, observing a coach face situations where technology does not work as anticipated, not panic, and instead find an alternate way to continue a successful learning experience can boost teacher confidence when in the same situation (Ertmer, 2005; Schunk, 2000). Framing technology failures as launching pads for growth provided teachers with feelings of success in their attempts at the integration process, regardless of end results technologically. With participants' knowledge that they were supported leading to increased confidence, situated coaching was effective at diminishing these barriers for participants.

Lingering barriers. This situated coaching intervention did not eliminate all barriers to integration. Six weeks of situated coaching did not affect participants' perceptions of a lack of time as a barrier. Additionally, as participants increased their instructional opportunities for student use of technology, additional barriers were revealed, including classroom management, outside expectations, and instructional alignment.

Time. Guskey (1986) cautioned that change in instructional practice requires teachers to invest significant amounts of time. With limited hours in a day, multiple researchers continue to report time as a prominent barrier for teachers (Gorder, 2009; Hew & Brush, 2007; Hsu, 2016; Kirkscey, 2012; O'Neal et al., 2017; Pittman & Gaines, 2015; Rives, 2012; Wright & Wilson, 2011). The barrier of time encompasses time to locate technology resources to use in instruction, time to plan and develop lessons integrating technology, and instructional time to use technology and implement integrated activities in the classroom. Emily cited a lingering barrier of time in her postinterview: "Just being able to take the time to find the resources that would be beneficial to this grade level…is the barrier for me." Melissa identified finding time to engage in conversation about instructional practices and improved technology integration as the biggest challenge. Amy expressed concerns about limited instructional time during the day throughout the intervention. The identification of time by all participants, including those with the least teaching experience (e.g., Amy = 2 years, Emily = 3 years) does not fully align with research by Hechter and Vermette (2013) that found teachers with more than four years of experience were more likely to cite time as a barrier. Because the availability of time influences teachers' application of professional learning to classroom practice (Penuel et al., 2007), a goal of professional development should be to lessen time requirements (Pittman & Gaines, 2015). In this intervention, I sought to save participants time by introducing online search strategies such as putting terms in quotation marks, including key terms like iPad or integration, and modeling how open-ended applications or platforms could be used for multiple concepts. I also sought to help teachers streamline existing processes such as Amy's daily formative assessment for

divisibility rules. Instead of students writing their answers each day for her to go around the room and check, we developed a Google Form to collect student responses that she could then see update in real time. Despite these examples, time remained a concern throughout the intervention, aligning with previous research showing a technology coach had limited impact on alleviating this barrier (Adams, 2015). This provides an implication for future research, as this barrier must be overcome or teachers will continually face pressure to revert to familiar practices in favor of saving time (Hartley, 2014).

Classroom management. Prior research suggests integrating technology into student-centered learning activities has potential to either distract students (Dennis, 2013; Tagsold, 2013) or engage students (Fairman, 2004; O'Neal et al., 2017; Ottenbreit-Leftwich et al., 2010). Earlier studies highlighting benefits of engagement were conducted as more consistent student use technology was first introduced into classrooms may have also benefitted from technology being a novelty for students and limited opportunities for activities beyond classroom tasks at hand. As technology became more routine for students and access to the Internet, social media, and streaming content increased, students' level of distraction may have seen a similar rise (Seemiller, 2017; Tagsold, 2013). Participants in this study cited positive changes to classroom management through student engagement. Amy reflected in her postinterview that while students were photographing natural plants and creating a PicCollage as part of a science investigation: "They were more engaged and they loved doing PicCollage. I think it's the artsy part of them mixed with the tech part of them." Emily identified a similar example: "As I saw from today's [introduction] to fractions, students were willing to share more of

their thinking and prior knowledge because they were interested in the lesson." Yet, there were also fears about students' access to inappropriate content. Sarah explained, "I also fear students accessing inappropriate information or images when they are working independently or accessing something new." Amy referenced her use of the student device monitoring software to ensure she could monitor students' activities. Participants' comments highlight the tension inherent in student-centered activities. While students are often more motivated and engaged, the possibility exists for distraction or behavior concerns. This barrier still existed after a coaching intervention, but more experience developing engaging, challenging, and differentiated tasks may continue to reduce management concerns (Dennis, 2013; Fairman, 2004).

Outside expectations. Teachers face high expectations from communities, parents, and administrators to integrate technology in ways that help students develop critical thinking, creativity, and collaborate with both peers and the global community (Elmendorf & Song, 2015; O'Neal et al., 2017). These outside expectations, specifically from administrators, can either positively or negatively influence teachers' practices and beliefs (An & Reigeluth, 2012; Becker & Riel, 1999). Participants in this study cited the negative effects of expectations when they reflected on their own practices. Emily felt the need to impress observers:

> I beat myself up a lot, because I'm self-conscious about everything that goes on in the classroom when I am in front of someone. I know that I need to learn how to better embrace that "messiness" because it is expected with student learners, but I think it's something I will always grapple with when I have someone in my room.

Amy still felt in her postinterview that "trying to hit the [indicators] that we're supposed to hit during [classroom observations]" was a barrier to her continued integration

practices. Melissa expanded on this feeling by saying, “Sometimes it is frustrating when you work so hard and you don’t get any points for [your work] or you get one point, which means not observed.” These comments resonate with those made in previous research in which participants felt stated expectations where beyond their capabilities (Durff, 2017). Coaches play a key role for teachers in bridging perceived expectations with classroom practice (Killion, 2012). Based on participants’ concerns, clarification of administrative expectations and coaching support are a continued need in order to dispel feelings of discouragement.

Implications

This research holds implications for me as a school administrator, district and school personnel in charge of professional development, and other researchers examining situated coaching as a professional development model. In the following section, three categories of implications are discussed in greater detail: (a) personal implications, (b) implications for technology professional development, and (c) implications for future research.

Personal Implications

I began this program as an instructional technology coach for the district and ended as an elementary school administrator. While I still assist teachers with integrating technology, my role has broadened. Nevertheless, this study yielded three implications for me as an instructional leader that I will continue to practice. These implications are (a) approaching a problem as a scholarly practitioner, (b) tailoring learning to the needs of adult learners, and (c) valuing progress in the learning process instead of only valuing the end result.

Approaching a problem as a scholarly practitioner. When I began as an instructional technology coach, I filled a newly created position for the school district. I had no model in place or true job description to guide my daily practice. Instead, I immediately began to try and improve district digital learning environment scores by focusing on teaching practices and digital tools, while giving little attention to research that could have informed my approach. A more methodical approach to a problem comes through using action research (Cochran-Smith & Lytle, 1993). I initially identified a problem with the trajectory of the district's Digital Learning Environment scores not on pace to meet stated technology goals. During this action research process, I reviewed existing relevant research to guide my process of data collection and develop a lens through which I analyzed and interpreted collected data, ultimately leading to a refined action plan to address the problem (Carr & Kemmis, 1986; Mills, 2011). By merging theory with my practice, I was able to implement a method of professional development designed to transfer learning from expert to novice with distinct characteristics effectively linked to learning outcomes (Collins et al., 1989; Garet et al., 2001; Hunzicker, 2011; Johnson et al., 2017). Whereas my previous workshops and professional development sessions were attempts at solving the problem, they did not have accompanying data to monitor their effectiveness. Herr and Anderson (2005) note, "formalizing the puzzles of practice into research is a way of working better, rather than doing more of the same only harder" (p. 73). Going forward, I plan to utilize an scholarly practitioner approach toward other instructional problems to identify supporting research studies, design and implement interventions, and use evaluations of their effectiveness as a basis for decision making.

Working with adult learners. Prior to this program, most of my formal education prior to and while I was a classroom teacher focused on pedagogy. First as a coach and now as an administrator, however, I work primarily with adults. As I researched andragogy (Knowles, 1973) as part of my research, a second implication I personally take from this study is ensuring I provide the necessary conditions for adults' cognitive development (Knowles, Holton III, & Swanson, 2015) in all planned learning activities. Whether planning a faculty meeting or working with an individual teacher, I need to keep the focus on the learner and not on me as instructor (Holyoke & Larson, 2009). Part of this intervention's success included the active role participants played in their learning, supporting previous research (Goddu, 2012; Knowles, 1973). I learned about the importance of having clear instructional objectives and a way for learners to know when those objectives have been mastered. The preinterview helped me assess the size of the gap between initial levels of understanding and the level to which I wanted them to attain by the end of the year. This is a practice I will continue for subsequent action research cycles due to the amount of actionable qualitative data generated. Overall, I come away from this study with a better understanding of how to structure professional learning activities using characteristics that meet the needs of adult learners and will incorporate these in future staff development planning.

This study also contains implications for where interactions with adults should occur for effective transmission of new learning. In the past as a technology coach for the district, most often I worked with adults in a training computer lab, a large meeting room, or a media center to accommodate large groups of adults. Often ideas and strategies presented were received well, but participants struggled to see how they could use the

learning with their students in their classrooms. Participants would start to let barriers such as their schedule, class size, or their own perceived lack of technology proficiency temper their willingness to adopt new practices. Situated cognition theory (Brown et al., 1989) informed my approach to this intervention by through giving me a greater understanding of the importance of context in learning. As a situated coach, I took new learning into participants' individual classrooms. In their own environments, they could see how strategies fit into their schedule and instructional routines with their own students, while feeling supported with coaching and feedback until they were more confident in their abilities. Participants shared having me directly in their classrooms helped them better learn and apply strategies and principles of integration. As a result, when planning future learning opportunities, I will prioritize introducing them in the context of teachers' classrooms instead of conference rooms.

Value in process. A noted gap in existing literature was the lack of a common instrument for measuring technology integration (Bebell et al., 2004; Christensen & Griffin, 2006; Dennis, 2013; Griffin & Christensen, 1999; Schmidt et al., 2009; Valentine, 2012). In planning this intervention, I incorporated AdvancED's ELEOT due to its widespread use in school and district accreditation (AdvancED, n.d.). By using an instrument with which I could quantify the observation of student behaviors, I sought to examine whether this situated coaching model helped foster student-centered uses of technology. While studying changed practice as an end result was similar to previous research (Mouza, 2009; Mouza & Barrett-Greenly, 2015; Kopcha, 2012), I almost overlooked participants' development in their understanding of the process of technology integration (Kopcha et al., 2020). Frequency of observation can be a misleading indicator

of integration practices, because of the greater time and complexity required for student-centered practices (Ertmer, 1999; Kopcha et al., 2020; Lei, 2010; Lei & Zhao, 2007). Instead, improvement can also be assessed through development and implementation of the decision-making process teachers undergo in determining how and why to use technology in instruction (Kopcha et al., 2020). As an instructional leader, I will need to be mindful of this balance between process and product with any initiative. Sometimes only looking at the end result does not fully indicate improvements in process that are still worthy of recognition.

Implications for Technology Professional Development

As districts continue to spend money on technology hardware and professional development (Every Student Succeeds Acts, 2015; ISTE, 2016), expectations for effective integration and a return on investment will similarly rise (U.S. Department of Education, 2017). With billions of dollars spent on technology (Miranda & Russell, 2012) and little gain in integration practices (Gray et al., 2010; Pittman & Gaines, 2015), professional development approaches need to change (Desimone et al., 2002; Garet et al., 2001; Parise & Spillane, 2010). Findings from this study lead to implications for everyone involved in planning, selecting, and providing professional development opportunities, including (a) participating teachers, (b) administrators, and (c) providers.

Implication for participating teachers. Participants in this study cited observing modeled instruction, engaging in opportunities for collaboration, planning new instructional methods, and reflecting on their own practice as effective characteristics of this situated coaching intervention. The cognitive apprenticeship model (Atkinson, 1997; Collins et al., 1989) includes each of these characteristics as components in transferring

knowledge and skills from expert to novice. Participants value modeling because they see how theory informs actual instructional practice through authentic activities (Collins, 2006; Collins, et al., 1991; Nichol & Turner-Bisset, 2006). During times of collaboration and planning, participants sought scaffolded levels of assistance with and feedback on their efforts at applying new integration strategies. Participants were directly involved in each coaching conversation. I made a concerted effort to talk through my suggestions and instructional rationales to make my thinking visible for the participant so they would be more apt to internalize the same thought processes and decision-making principles (Collins, 2006; Collins et al., 1991; Dennen & Burner, 2007; Ghefaili, 2003). Finally, participants needed time to reflect on their own practices and compare them with those that were initially modeled or the practices of their peers to identify critical similarities and differences.

All of these characteristics suggest participating teachers learn more when they take an active role in their learning, which aligns with previous research (Blank, 2013; Garet et al., 2001; Hunzicker, 2011; Johnson et al., 2017; Pettet, 2013). Active learning includes inquiry, cooperative learning, opportunities to practice new skills or practices, and receiving peer feedback (Johnson et al., 2017). When attending professional development, regardless of presentation format, actively engaging in the learning contributes to improvements in participant understanding and changes to practice (Darling-Hammond, 1997; Garet et al., 2001; Johnson, 2011; Johnson & Fargo, 2010). Therefore, teachers want to pursue professional learning that provides opportunities for active learning, such as modeling, collaboration, co-planning instruction, instead of passive and quiet receipt of information.

Implications for administrators. When reflecting on this intervention design, participants contrasted the six weeks of situated coaching with more traditional forms of professional development that are often for a short length of time with a limited duration (Gray, Thomas, & Lewis, 2010; Johnson et al., 2017; Matzen & Edmunds, 2007). Historically, administrators have chosen more traditional forms of professional development to ensure all teachers hear the same information in the least amount of time and at the lowest cost (Diaz-Maggioli, 2004; Oliver-Brooks, 2013). However, participants found value in six weeks of a coaching relationship, though they expressed the desire for an even longer duration. Sarah said she was would be willing to continue the coaching partnership beyond the intervention period. Amy wanted to continue working together for an additional six weeks. Melissa proposed working together for another four weeks after the conclusion of this intervention. All of this suggests administrators need to consider committing to professional development for long durations. Research suggests professional development is more effective at positively changing teachers' practices and beliefs when the professional development occurs over an ongoing duration (Banilower et al., 2007; Hunzicker, 2011; Johnson et al., 2014; Johnson & Fargo, 2010; Penuel et al., 2007; Supovitz & Turner, 2000). Research has not specified an ideal duration, but recommendations range from 20 hours (Garet et al., 2001) to 100 hours of time (Banilower et al., 2007; Blank, 2013). Beasley and Sutton (1993) found 30 hours of professional development merely reduced anxiety surrounding technology to the point that participants were ready for next steps in learning. Martin and colleagues (2010) suggest professional development should be a series of contacts with relevant support in between. A coaching model satisfies this goal of sustained duration

(Blazar & Kraft, 2015; Desimone, 2009; Desimone & Pak, 2017) by using repeated cycles of interaction throughout a year (Teemant, 2013). Administrators would be wise to investigate some form of coaching over isolated workshops when looking to see teacher growth. In order to pursue this method, however, administrators need to make concessions to their traditional approach of professional development. They must be willing to creatively provide time during the instructional day for coach and teacher collaboration. Rather than the small portion of a budget typically allotted for professional development (Parise & Spillane, 2010), administrators must make the budgetary adjustments necessary to create one or more coaching positions at the school (Marsh et al., 2015). This will not be easy, as the cost of coaches is estimated to be 6 to 12 times higher than traditional professional development (Mangin, 2009). For schools who already operate on a tight budget, this may mean prioritizing a coaching position at the expense of other budget categories or combining some existing positions to make room for a coach (Marsh et al., 2015). Finally, administrators need to relinquish control over uniformity of delivery and trust a coach can effectively use individualized techniques, pacing, and levels of support to move teachers forward using overarching, guiding principles (Penuel, 2006; Picciano, 2006).

Implication for providers. Melissa encapsulated a difference between this intervention and traditional forms of professional development when she referenced my "willingness to get in the trench with us" during her postinterview. Amy spoke in her preinterview about how she looked forward to having me in her classroom, as it would give more of an opportunity to learn during the workday instead of trying to find additional time outside of regular school hours. Bringing coaching and learning to the

context of participants' classrooms allowed me to focus on their specific instructional content while tailoring conversations and activities to align with their individual needs and priorities, supporting previous research findings (e.g., Desimone et al., 2002; Garet et al., 2001; Hunzicker, 2011; Johnson et al., 2017; Parise & Spillane, 2010). Embedding professional development within individual teachers' instructional contexts also allows teachers to see the relevance of new learning and adopt new practices in ways authentic to their classroom environment (Hunzicker, 2011; Parise & Spillane, 2010). One possible way to help embed professional development is through virtual conferencing between coach and participant during periods of collaboration and reflection (Desimone & Pak, 2017; Lawless & Pellegrino, 2007; Sugar & Slagter van Tryon, 2014). This approach reduces travel time, allowing the coach to meet with more participants, while still allowing for contextually based discussion. A second possible way to increase the amount of embedded professional development is through the use of coaching cycles (Chapman & Mitchell, 2018; Knight et al., 2015). Coaching cycles allow for concentrated sequences of coaching followed by periods of time for teachers to implement new learning while the coach completes a cycle with a second group of teachers in an alternating sequence. Regardless of how embedded time in increased, findings from this study imply embedding professional development for teachers will increase providers' effectiveness at transmitting learning.

A second implication for providers is to narrow participants' focus to instructional goals. In this study, an open-ended question about participant goals mostly revealed a desire for greater use of technology. However, if teachers set low-level goals for technology use, they are less likely to make changes to their pedagogy (Zhao & Cziko,

2001). Rather, teachers' technology professional development goals should not focus on the technology but should align with instructional goals and student needs (Burke, 2014; Ottenbreit-Leftwich et al., 2010). Providers should assist teachers with incorporating best practices for technology integration within the pursuit of their instructional goals (Adams, 2015).

Implications for Future Research

Findings from this study suggest five implications for future research into technology integration, professional development, and coaching: (a) using an instrument that objectively measures progress in understanding, not just end result classroom practices, (b) using a longer duration of a coaching intervention and studying the model's impacts over a longer term, (c) providing teachers dedicated time to plan and integrate technology, (d) coaching a larger number of teachers with varying degrees of desire for growth, and (e) identifying steps to grow teachers already receiving top marks on measurements of integration.

Using an instrument to measure progress. Previous research primarily relied on self-reported data in which participants shared their feelings about professional development experiences and their perceptions of resultant changes to their beliefs and practices (Gaytan & McEwen, 2010). Researchers (e.g., Judson, 2006; Lawless & Pellegrino, 2007) noted the questionable reliability of self-reported measures. Judson (2006) suggested using observations as a more accurate way to assess the effectiveness of professional development. This study used AdvancED's ELEOT instrument to capture observed changes to instructional practice and student learning. However, this instrument did not effectively capture participants' progress in understanding the process of

technology integration and instructional decision making. Much of technology integration research to date has overlooked focusing on this complex process, a concern noted by multiple researchers (e.g., Hennessey, Ruthven, & Brindley, 2005; Kopcha, 2020; McCulloch, Hollebrands, Lee, Harrison, & Mutlu, 2018; Tondeur, van Braak, Ertmer, & Ottenbreit-Leftwich, 2017). Future research could look at triangulating data to measure how teachers integrate technology and why they make instructional decisions to better capture progress in participants' understanding (Creswell et al., 2006). For example, future mixed-method studies could coach participants in the use of the Triple E Framework (Kolb, 2017) for making decisions about technology integration, and then interpret their application of this framework through the Teacher Response Model (Kopcha et al., 2020). Such an approach, using video recorded teacher planning sessions, follow up interviews, and reflection journals, would investigate how teachers go through a decision making process and their rationale for instructional decisions.

Longer duration of intervention. The intervention in this study included six weeks of situated coaching. This longer duration than previous professional development workshops was structured based on findings from previous research on effective professional development (Garet et al., 2001; Hunzicker, 2011; Penuel et al., 2007). With three and a half hours of contact each week, participants received 21 hours of coaching services over the six-week period, but this duration falls short of what some suggest is required for deep, abiding professional learning to occur (Banilower et al., 2007; Blank, 2013; Beasley & Sutton, 1993). Previous research criticized short-term professional development when it lacks ongoing support, involves a passive learning experience for participants, and fails to align with contextual factors (Garet et al., 2001; Guskey &

Yoon, 2009). Watkins and colleagues (1998) found most studies only measure participants' immediate reactions to professional learning without taking a longitudinal approach to additionally measure learning, new behaviors, and results on student achievement. For this more comprehensive look at the impact of professional development, time must pass between training and evaluation so participants can authentically apply new knowledge and skills to their instructional practices. Doherty (2011) conducted follow-up interviews to gauge participants' implementation of new learning three months after an intervention. He theorized a lack of implementation was due to an insufficient interval of time because a new semester had not yet started for more significant changes to be made. However, other research indicates Doherty may have needed much longer than a semester to see results. Shapley and colleagues (2010) illustrated the need for long-term interventions and the slow pace of instructional change. In a three-year longitudinal study, they found that student use of technology in participants' classrooms increased from rarely to sometimes. Ertmer (2005) suggested teachers take five to six years to fully embrace new pedagogical practices. Based on past research, participants' reflections from this intervention, and suggestions of Czajka and McConnell (2016), future research should examine the effects of a multiyear professional development intervention over an equal number of succeeding years to track resultant changes to beliefs and practices.

Provision of dedicated time. Ertmer (1999) identified first-order barriers as factors external to a teacher that inhibit technology integration practices, such as access, time, and support. Ertmer also identified teachers' perceptions of first-order barriers as a determining factor in the depth and complexity with which they integrated technology.

Where districts invest in technology resources and support personnel, many of these barriers have been alleviated for teachers (Ertmer et al., 2012). Participants in this intervention did not face barriers of access or support but still faced the barrier of time. Time weighed heavily on the minds of this study's participants both before and after the intervention, appearing through their reflection journals as a hindrance to integration. A lack of time precludes teachers from locating digital resources to support instruction, strategically planning lessons integrating technology, and devoting limited instructional minutes to activities using technology (Gorder, 2009; Hew & Brush, 2007; Hsu, 2016; Kirkscey, 2012; O'Neal et al., 2017; Pittman & Gaines, 2015; Rives, 2012; Wright & Wilson, 2011). Teachers' sense of time as a barrier influences the depth and frequency of their application of professional learning to classroom practice (Berg et al., 1998; Penuel et al., 2007). Therefore, future research should identify strategies for reducing teachers' concerns about time and examine resultant changes to curriculum and instructional planning to see if depth and complexity increase (Pittman & Gaines, 2015). For example, administrators can provide periodic days during the school year for teams of teachers to collaboratively plan instruction and technology integration (Ertmer, 1999). Use of social networking and connecting with a larger network of practitioners outside of the school can also reduce time requirements for planning and locating resources (Ertmer, 1999; Ertmer, 2015). Finally, teachers can eliminate what they deem to be nonessential content from their typical sequence of instruction to create time for technology-integrated activities (Becker, 1994).

Addressing multiple teachers. This study included four volunteer participants who were naturally inclined to want to improve their understanding of technology

integration and related classroom practices. If this intervention were scaled up to include more teachers, not all may be as willing or eager to change. This study, as well as previous research (Marsh et al., 2015), raises an implication for future research to include non-volunteer participants in working with a coach to see if similar changes to practice occur. In order to increase the number of participants working with a coach, a coach could work with an entire grade level at once or with multiple grade levels with focus on a single subject (Czajka & McConnell, 2016). When including reluctant teachers in the intervention, researchers suggest using a coach with credible, advanced expertise in technology and instruction who can then use interpersonal skills and adult learning strategies to foster collaborative relationships (Marsh et al., 2015).

What comes next for expert teachers. Much of existing research on coaching focuses on either preservice teachers or novice teachers (Ben-Peretz et al., 2018). Novice teachers may include those new to the profession or at a beginning level of proficiency with the coaching focus. This intervention included four participants who began with limited experience in technology integration and low frequencies of observation using the ELEOT. However, researchers note that school improvement comes through lifelong professional learning, even after reaching top marks on evaluation instruments (Darling-Hammond, 2008; Feiman-Nemser, 2012; Flores & Day, 2006). This suggests future research must also examine how to continually grow teachers who may equal or surpass the expertise of a coach. One possible method for exploration is peer coaching for established professionals (Bergen et al., 2006; Zwart et al., 2008). In peer coaching, two or more individuals support one another in improving instructional practices (Lu, 2010). While growth may not appear on observation or evaluation instruments due to their

already achieving top ratings, qualitative data capturing discussion, deliberation, and reflection may yield insights into how to continue professional learning (Ben-Peretz et al., 2018).

Limitations

This study was not without limitations that could be improved upon in future research. These limitations are organized into those related to (a) study design, (b) study population, and (c) the researcher.

Study Design

The design of this study limits the generalizability of results beyond a local context. A small sample size of only four participants may have affected any variation in collected data (Radecki, 2009). Additionally, the short duration of this study potentially limited evidence of change in participant beliefs or practices (Ottenbreit-Leftwich et al., 2010; Rives, 2012). This study was conducted over approximately ten weeks total, including the six weeks of intervention and subsequent observations. A longer study, lasting one or more years, may better capture new learning translating into classroom practices (Kraft & Blazar, 2018). A third design limitation resulted when participants shared new learning with non-participant colleagues, thereby potentially affecting the schoolwide data used in comparisons (Kraft & Blazar, 2018). A treatment or control design would better position future researchers to isolate the effect sizes of coaching on changes to classroom practice (Kraft & Blazar, 2018; Lawless & Pellegrino, 2007). This study used interviews to gain rich qualitative data through participant explanation of their thoughts and experiences, but a fourth limitation was that the presence of the researcher in the interviews may have unduly influenced participants' responses (Adams, 2015).

Creswell (2014) also noted limitations of using interviews include information reported through participants' perceptions, occur in a contrived setting, and the quality of information shared may be inhibited by participants' ability to articulate their thoughts. This study was designed to determine a situated coaching model's impact on classroom practice. This emphasis limited the amount of insight gathered on participants' thought process about technology integration and lesson design prior to the classroom observations, potentially overlooking incremental progress (Hsu, 2016; Kopcha, 2020; Vongkulluksn et al., 2017). Fully capturing classroom practice through quantitative observation scores was limited due to the short 20-minute observation windows (McKnight et al., 2016), inherent researcher subjectivity in assigning ratings (Kawulich, 2005), and limited number of observations per participant. The limitation of subjectivity was partially mitigated by my being a certified observer using the ELEOT. Longer windows of observation or multiple raters with demonstrated interrater reliability could further mitigate these limitations.

Population

The population for this study also had a set of limitations. First, selection of participants included purposive sampling measures (Jenkins, 2013) to exclude first-year teachers, those new to the building, and teachers outside of a limited elementary grade band (i.e. anyone outside of second through fifth grade). It is possible that working with new teachers, teachers with younger students, or middle or high school teachers would have yielded different results. A second limitation is that the population of this study was all females (Ottenbreit-Leftwich et al., 2010). Had there been at least one male participant, gender dynamics between coach and participant may have led to different

outcomes. Thirdly, the four participants in this study were volunteers who were eager to learn and grow in their technology integration practices (Burke, 2014; Carver, 2016; Heimer, 2017; Marsh et al., 2015; Rives, 2012). Working with reluctant teachers may lead to different perceptions of situated coaching and may influence the time before observed changes to beliefs or practice occur. Fourth, a preexisting relationship existed between me as a coach and the participants (Beeson, 2013; Czajka & McConnell, 2016), first as a district instructional technology coach and then as a building administrator. A coach just beginning to work with a group of teachers may need a longer time to build trust and rapport before teachers share their vulnerabilities, challenges, and willingness to accept offered support. Finally, this study took place in an elementary school equipped with 1:1 technology for students more than four years prior to this study (Beeson, 2013). A situated coaching model in a site with more limited access to technology or with a more newly established 1:1 environment may see different rates of change in practice and beliefs.

Researcher

Finally, I may have contributed additional limitations as the researcher. When collecting and analyzing data, my own biases and assumptions may have influenced my observations of participant classrooms (Kawulich, 2005; Rives, 2012; Seid, 2017). However, triangulation through the use of interviews and journals helped ensure any potential negative aspects would still be brought to my attention (Creswell, 2017). Member checking (Creswell, 2017) of transcripts and findings was also used to ensure accuracy in representing their perceptions and experiences. Additionally, while confidentiality measures (e.g., pseudonyms, numerical IDs, aggregating data, and

member checking) were all instituted to aid in a willingness to respond openly and honestly, there is the potential that my presence in data collection could have influenced responses both in journals and interviews.

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APPENDIX A

CONSENT FORM

UNIVERSITY OF SOUTH CAROLINA

CONSENT TO BE A RESEARCH SUBJECT

A Situated Coaching Model's Effect on Teachers' Perceptions and Practices

KEY INFORMATION ABOUT THIS RESEARCH STUDY:

You are invited to volunteer for a research study conducted by Rob Burggraaf. I am a doctoral student in the Department of Education, at the University of South Carolina. The University of South Carolina, Department of Education is sponsoring this research study. The purpose of this action research will be to evaluate the impacts of a situated coaching model on teachers' perceptions of issues related to integration of student use of digital tools into their classrooms and on digital learning environment observation scores for elementary classroom teachers at a [redacted] elementary school. You are being asked to participate in this study because you are a [redacted] elementary teacher who has completed at least one full year of teaching. This study is being done at [redacted] and will involve approximately six volunteers.

Current instructional technology professional development offerings in [redacted] are isolated sessions, typically conducted at the district office or during professional development cohorts. These opportunities do not allow for direct classroom practice with feedback, relation to specific content taught by participants, or sustained contact with instructional technology coaches. This action research study will examine how situating a coach within the elementary school to work directly with teachers during their daily planning and instruction affects both participating teachers' perceptions of barriers to implementing a digital learning environment and digital learning environment scores as measured by AdvancED's ELEOT instrument.

This form explains what you will be asked to do, if you decide to participate in this study. Please read it carefully and feel free to ask questions before you make a decision about participating.

PROCEDURES:
If you agree to participate in this study, you will do the following:

1. Be interviewed in your classroom for approximately sixty minutes about your perceptions of barriers to implementing a digital learning environment in your classroom, having your interview recorded in order to ensure the details that you provide are accurately captured. A transcription will be provided. You will be sent the transcript and given the opportunity to correct any factual errors. The transcript of the interview will be analyzed by Rob Burggraaf as the lead researcher. Access to the interview transcript will be limited to Rob Burggraaf and university academic advisors with whom he might collaborate as part of the research process. Any summary interview content, or direct quotations from the interview, that are made available through academic publication or other academic outlets will be anonymized with a pseudonym so that you cannot be directly identified, and care will be taken to ensure that other information in the interview that could identify you is not revealed. The actual recording will be stored on a password-protected computer for the duration of the research and permanently deleted upon the conclusion of the research project. Any variations of the above conditions will only occur with your further explicit approval
2. Partner with me, the researcher, for a period of six weeks. I will seek to work together to develop your incorporation of student technology use for assessing student learning and differentiating student instruction based on assessment results. Each week, I will spend three and a half hours of time with you in your classroom. This will include one half hour per week during your daily planning period, one hour per week after school for reflection and additional planning, and two hours per week of classroom assistance. For the first two weeks, planning will focus on application of learning in math. During the middle two weeks, planning will focus on math and language arts. Finally, the last two weeks will involve applying learning across all of a teacher's content areas. Depending on individual needs shared during planning and reflection, classroom assistance will take many forms, including modeling a lesson, co-teaching, observing, or giving formative coaching tips as you lead a lesson. Each week will build from your progress the prior week through a cyclic process of coaching, practicing, and reflecting.
3. During this coaching period, you will maintain a reflection journal responding to three provided prompts per week.
4. In the month following the coaching period, receive two unannounced observations in your classroom using the ELEOT instrument, specifically focusing on the digital learning environment.
5. Submit your completed reflection journal
6. Be interviewed in your classroom again for approximately sixty minutes about your perceptions of barriers to implementing a digital learning environment in your classroom, having your interview recorded in order to ensure the details that you provide are accurately captured.

DURATION:
The entire study will last for approximately fourteen weeks. The coaching partnership phase will last for six weeks and require three and a half hours of contact time per week. All but one of these hours each week will take place during your regular workday. Time for responding to prompts in your reflection journal will take additional time during the coaching phase.

RISKS/DISCOMFORTS:
Loss of Confidentiality:
There is the risk of a breach of confidentiality, despite the steps that will be taken to protect your identity. Specific safeguards to protect confidentiality are described in a separate section of this document.

BENEFITS:
You may benefit from participating in this study by adopting new thought processes for planning and learning new instructional strategies for integrating student use of technology.

COSTS:
There will be no costs to you for participating in this study.

PAYMENT TO PARTICIPANTS:
You will not be paid for participating in this study.

CONFIDENTIALITY OF RECORDS:
Unless required by law, information that is obtained in connection with this research study will remain confidential. Any information disclosed would be with your expressed written permission. Study information will be securely stored in locked files and on password-protected computers. Observation results will be recorded under pseudonym teacher names and the data will be aggregated for reporting. Results of this research study may be published or presented at seminars; however, the report(s) or presentation(s) will not include your name or other identifying information about you.

VOLUNTARY PARTICIPATION:
Participation in this research study is voluntary. You are free not to participate, or to stop participating at any time, for any reason without negative consequences. In the event that you do withdraw from this study, the information you have already provided will be kept in a confidential manner. If you wish to withdraw from the study, please call or email the principal investigator listed on this form.

I have been given a chance to ask questions about this research study. These questions have been answered to my satisfaction. If I have any more questions about my participation in this study, or a study related injury, I am to contact Rob Burggraaf at 803-351-1306 or email rburggraafsc@gmail.com.

Questions about your rights as a research subject are to be directed to, Lisa Johnson, Assistant Director, Office of Research Compliance, University of South Carolina, 1600 Hampton Street, Suite 414D, Columbia, SC 29208, phone: (803) 777-6670 or email: LisaJ@mailbox.sc.edu.

I agree to participate in this study. I have been given a copy of this form for my own records.

By signing this form, I agree that:

- I am voluntarily taking part in this project. I understand that I don't have to take part, and that I can stop the interview at any time
- The transcribed interview or extracts from it may be used as described above
- I have read all of the information above
- I understand I will not receive any benefit or payment for my participation
- I will receive a copy of the transcript of my interview and may make edits I feel necessary to ensure factual accuracy and the effectiveness of any agreement made about confidentiality
- I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future.

Printed Name: _____

Participant's Signature: _____ Date: _____

Researcher's Signature: _____ Date: _____

APPENDIX B

INITIAL SEMI-STRUCTURED INTERVIEW PROTOCOL

Time of interview:

Date:

Place:

Interviewer:

Interviewee:

Good afternoon! Thank you for taking this time out of your day. This interview will take approximately 30 minutes. While no risks are anticipated as a result of your participation, you have the right to stop the interview or withdraw from the research at any time.

Introduction

1. What do you hope to learn as a result of participating in this study?
2. How does technology relate to the pedagogical foundations that form the basis for your classroom practices?

General Information

3. Give an example of technology integration you have tried thus far and your thoughts about the experience.
4. Describe what you think an effective digital learning environment looks and sounds like.

Instructional Coaching

5. To what degree do you utilize the district's instructional technology coaches? Why?
6. What kind of coaching support would you like to have during this study?
7. In what area are you interested in collaborating? Why?
8. What do you perceive as being the biggest barrier for us to overcome while working together? Why?

APPENDIX C

FOLLOW UP SEMI-STRUCTURED INTERVIEW PROTOCOL

Time of interview:

Date:

Place:

Interviewer:

Interviewee:

Good afternoon! Thank you for taking this time out of your day. This interview will take approximately 30 minutes. While no risks are anticipated as a result of your participation, you have the right to stop the interview or withdraw from the research at any time.

Introduction

1. How does your instructional planning now compare to your instructional planning before the coaching intervention?
2. Give an example of how your instructional practices changed over the last six weeks. What do you attribute this change to?

Instructional Coaching

3. Which coaching practices were most/least useful to you? Why?
4. What characteristics of this situated coaching model did you value the most? Why?
5. Tell me about how a specific lesson changed as a result of coaching collaboration.
6. How could this coaching model have been improved for greater effectiveness?
7. What barrier(s) are you able to work through now as a result of this coaching intervention? How are you able to work through them?
8. What barrier(s) still exist when trying to integrate student use of technology into lessons?

APPENDIX D

EFFECTIVE LEARNING ENVIRONMENTS OBSERVATION TOOL

Effective Learning Environments Observation Tool (eleot® 2.0)

The purpose of this tool is to help you identify and document observable evidence of classroom environments that are conducive to student learning. Circle the number that corresponds with your observation of each learning environment item descriptor below. As needed and appropriate make inquiries with learners.

Date _____ School _____ City _____ State/ Province _____ Country _____ Grade Level(s) _____

Time In _____ Time Out _____ Check ALL that apply: Lesson Beg. ___ Lesson Middle ___ Lesson End ___ Subject Observed _____ Observer Name _____

	Very Evident	Evident	Somewhat Evident	Not Observed
A. Equitable Learning Environment:				
1. Learners engage in differentiated learning opportunities and/or activities that meet their needs	4	3	2	1
2. Learners have equal access to classroom discussions, activities, resources, technology, and support	4	3	2	1
3. Learners are treated in a fair, clear and consistent manner	4	3	2	1
4. Learners demonstrate and/or have opportunities to develop empathy/respect/appreciation for differences in abilities, aptitudes, backgrounds, cultures, and/or other human characteristics, conditions and dispositions	4	3	2	1
B. High Expectations Environment:				
1. Learners strive to meet or are able to articulate the high expectations established by themselves and/or the teacher	4	3	2	1
2. Learners engage in activities and learning that are challenging but attainable	4	3	2	1
3. Learners demonstrate and/or are able to describe high quality work	4	3	2	1
4. Learners engage in rigorous coursework, discussions, and/or tasks that require the use of higher order thinking (e.g., analyzing, applying, evaluating, synthesizing)	4	3	2	1
5. Learners take responsibility for and are self-directed in their learning	4	3	2	1
C. Supportive Learning Environment:				
1. Learners demonstrate a sense of community that is positive, cohesive, engaged, and purposeful	4	3	2	1
2. Learners take risks in learning (without fear of negative feedback)	4	3	2	1
3. Learners are supported by the teacher, their peers and/or other resources to understand content and accomplish tasks	4	3	2	1
4. Learners demonstrate a congenial and supportive relationship with their teacher	4	3	2	1
D. Active Learning Environment:				
1. Learners' discussions/dialogues/exchanges with each other and the teacher predominate	4	3	2	1
2. Learners make connections from content to real-life experiences	4	3	2	1
3. Learners are actively engaged in the learning activities	4	3	2	1
4. Learners collaborate with their peers to accomplish/complete projects, activities, tasks and/or assignments	4	3	2	1

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	Very Evident	Evident	Somewhat Evident	Not Observed
E. Progress Monitoring and Feedback Environment:				
1. Learners monitor their own learning progress or have mechanisms whereby their learning progress is monitored	4	3	2	1
2. Learners receive/respond to feedback (from teachers/peers/other resources) to improve understanding and/or revise work	4	3	2	1
3. Learners demonstrate and/or verbalize understanding of the lesson/content	4	3	2	1
4. Learners understand and/or are able to explain how their work is assessed	4	3	2	1
F. Well-Managed Learning Environment:				
1. Learners speak and interact respectfully with teacher(s) and each other	4	3	2	1
2. Learners demonstrate knowledge of and/or follow classroom rules and behavioral expectations and work well with others	4	3	2	1
3. Learners transition smoothly and efficiently from one activity to another	4	3	2	1
4. Learners use class time purposefully with minimal wasted time or disruptions	4	3	2	1
G. Digital Learning Environment				
1. Learners use digital tools/technology to gather, evaluate, and/or use information for learning	4	3	2	1
2. Learners use digital tools/technology to conduct research, solve problems, and/or create original works for learning	4	3	2	1
3. Learners use digital tools/technology to communicate and/or work collaboratively for learning	4	3	2	1

NOTES:

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APPENDIX E

ELEOT RATINGS GUIDE

eleot®

AdvancED® e|Prove™

Effective Learning Environments Observation Tool® (eleot®)

Ratings Guide

When observing in classrooms, consider the following factors as you determine the rating for each eleot® item:

- Routine and Systemic
- Quality of Application
- Quantity of Students Applying Item
- Frequency of Application

The factors are listed in order of importance from greatest to least. Thus, the "routine and systemic" category carries more weight than "frequency of application." The rubric below is intended to provide guidance and is not the simple average of the four factors. Observers should use professional knowledge and judgment in determining the final item rating based on the rubric.

Factors to consider when using eleot:	VERY EVIDENT 4	EVIDENT 3	SOMEWHAT EVIDENT 2	NOT OBSERVED 1
Routine and Systemic	Clearly understood, familiar practice and a regular part of the classroom environment	Generally understood practice but not completely routine	Singularly used practice and/or not part of the regular routine	Not observed
Quality of Application	Deep and more complex application of item	Moderate to some complex application of item	Superficial or simple application of item	No application of item
Quantity of Students Applying Item	All or most students are applying item	At least half of students are applying item	Some or only a few students are applying item	No students are applying item
Frequency of Application	The item is observed with high frequency	The item is observed with moderate frequency	The item is observed once or very few times	Not observed

APPENDIX F

REFLECTION JOURNAL PROMPTS

Week One

1. What do you want to achieve during this coaching partnership?
2. How does student use of technology align with my school and class mission and vision? (Perkins, 2017)
3. How do you find yourself responding when technology doesn't work as anticipated?

Week Two

1. What can lead to frustration and non-productive struggle for students when using technology? How can this be alleviated? (Perkins, 2017)
2. What is your biggest fear when planning for student use of technology? Why?
3. Are all students in your class able to access and leverage the technology for learning? If so, how do you know? If not, what additional measures might you need to put in place going forward? (Perkins, 2017)

Week Three

1. How has the incorporation of technology impacted student learning in your classroom?
2. What has been your biggest frustration so far while working with a technology coach? Explain.
3. What is your biggest area of growth so far in working with a technology coach? Explain.

Week Four

1. Do the ways you are incorporating student use of technology allow students to control their own learning? Explain. (Perkins, 2017)
2. What is an example of how you have started with purpose and pedagogy before considering technology? (Perkins, 2017)
3. How do you find yourself responding when technology doesn't work as anticipated?

Week Five

1. How can you combine technology you've used thus far with other tools and strategies to grow student learning?
2. Does the student use of technology in my classroom help all of your students think and learn more deeply? Explain. (Perkins, 2017)

3. Which ELEOT indicator do you find it most difficult to plan for? Why?

Week Six

1. How has your thinking about planning for and implementing student technology use changed as a result of this coaching partnership?
2. What new thought processes or strategies will you most likely to continue after this partnership? What will be the hardest to continue after this partnership?
3. What is your biggest area of growth in working with a technology coach? Explain.

APPENDIX G

TECHNOLOGY INTEGRATION EXAMPLES WITH ELEOT SCORES

Indicator	**1**	**2**	**3**	**4**
Learners use digital tools/technology to gather, evaluate, and/or use information for learning	Indicator not observed	No participant examples with this score	Using an iPad as a reference chart for various types of polygons	Using iPads to photograph examples of geometric terms; watching online video to gather facts about fish; individually playing online review game
Learners use digital tools/technology to conduct research, solve problems, and/or create original works for learning	Indicator not observed	No participant examples with this score	No participant examples with this score	Creating digital presentation illustrating geometric terms; using digital resources to research animals
Learners use digital tools/technology to communicate and/or work collaboratively for learning	Indicator not observed	One small group of students holding a book club discussion about a recent digital audio book	Reading selected texts independently and then synthesizing information in small groups to answer a question; whole class using iPads to illustrate their thinking while the teacher views their screens	Groups completing and sharing digital presentations; class discussion based on online video; using a shared whiteboard; playing a digital game with a partner; solving digital escape room puzzles in groups